Towards a Realist Methodology for School Effectiveness Research: A Case Study of Educational Inequality from Mexico

Sandoval Hernandez, Andres

Award date:
2009

Awarding institution:
University of Bath

Towards a Realist methodology for School Effectiveness Research: A Case Study of Educational inequality from Mexico

Volume 1 of 1

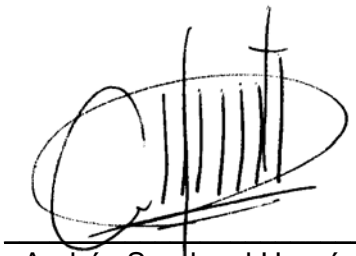
Andrés Sandoval Hernández

A thesis submitted for the degree of Doctor of Philosophy

University of Bath

Department of Education

November 2009



Andrés Sandoval Hernández

Dated: 21st April 2010

“Not everything that can be counted counts,
and not everything that counts can be counted”
- Albert Einstein

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGMENTS

I would like to thank Prof. Hugh Lauder for the patient guidance, uninterrupted encouragement and sound advice provided throughout my time as PhD student. I can hardly think of anything that could make Prof. Lauder a better supervisor. I would also like to express my sincere gratitude and appreciation to my second supervisor Dr. Anthony Robinson. His guidance and support played a very important role in my research.

I must express my gratitude to Claudia. The completion of this work would have not been possible without her unconditional support and understanding.

Finally, I would like to thank The National Council on Science and Technology (CONACYT, Mexico), The Institute of International Education, the Ford Foundation and the Bank of Mexico for providing the funding which allowed me to undertake this research.

To Andrea

ABSTRACT

Research into factors associated with school outcomes has been undertaken for nearly forty years, during which time it has identified many key factors and influenced much public policy aimed at improving the quality of education. However, the results of these policies have not shown the intended results, especially regarding the equity of opportunities in education. This thesis concerns the development of a Realist methodology to School Effectiveness Research, its application and the analysis of its limits and possibilities. By applying this methodology a second objective is covered: to identify, justify, and test inequity patterns of the lower-secondary education in Mexico and to postulate theoretical models to explain them.

To reach these objectives this thesis engages in the appraisal of the fundamental theoretical assumptions and characterisation of three different research programmes, these are: the dominant School Effectiveness Research programme (SER), a Realist Approach to School Effectiveness Research (RASER) and a Practitioners Approach to School Effectiveness Research (PASER). As a result of this theory appraisal RASER is judged as the programme that provides the most promising tools for taking the field forward by constructing explanatory theories of the mechanisms involved in school effectiveness.

Then, an adaptation of Haig's Realist Abductive Theory of Scientific Method (ATOM) to school effectiveness research is developed and presented. This adaptation of ATOM is applied using the results of a sample of the students who were finishing the lower-secondary education in Mexico in 2005 in the Quality and Achievement Examinations.

In the light of this theoretically informed empirical analysis it is argued that this thesis makes contributions in three areas: a proposal of a realist methodology that has the potential to advance school effectiveness research; developments in theory construction to explain mechanisms of reproduction of educational inequalities and; the establishment of bases for the formulation of better informed public policies.

1. Introduction

This thesis is fundamentally concerned with the development of a Realist methodology to School Effectiveness Research and with its application in a particular context in order to analyse the limits and possibilities of such a methodology. By applying this methodology a second objective is covered: to identify, justify, test and postulate theoretical explanations to some of the inequity patterns of lower-secondary education in Mexico.

Research into school effectiveness has been undertaken for nearly forty years. During this time one research programme, that commonly know as the School Effectiveness Research Programme (SER) has been dominant (Miles, 1998; F. J. Murillo, 2007). During this time it has identified key factors associated with school outcomes and its principles and models of effectiveness have been applied in more than 50 countries around the world. Nowadays it is difficult to find a public policy aiming improvement of the quality of education that does not find its justification in the knowledge generated by SER.

However, SER has received important criticisms regarding its theoretical, methodological and policy commitments that have fuelled a prolific debate about its boundaries and potentials. Furthermore, SER's achievements and debates have taken place, largely in the context of developed countries, while in Latin America, and especially in Mexico, the development of SER is still incipient.

All this makes it evident that SER has now reached a point where it is necessary to review and evaluate its fundamental theoretical (including ontological and epistemological) assumptions, in order to guarantee the accomplishment of the goals originally set for it.

As it is recognised that research into school effectiveness is not a monolithic programme, the second chapter of this thesis engages in the appraisal of the fundamental theoretical assumptions and characterisation of three different research programmes operating within school effectiveness research , these are: the dominant School Effectiveness Research programme (SER), a Realist Approach to School Effectiveness Research (RASER) and a Practitioners Approach to School Effectiveness Research (PASER). The main objective of this theory appraisal is directly related to the first research question guiding this work:

A. Which research programme might provide the best way of understanding and taking forward school effectiveness research?

To answer this question Lakatos' (1970) notion of research programmes is used, as it provides a fruitful framework whereby theories can be appraised. It is important to mention that, at this point, theory appraisal refers to what can be understood as the 'metaphysics' underlying the more testable parts of the theories involved, that is the view of human nature, the way of articulating the relationship of that nature to society, and the way to relate the first two points to social change, as well as an appraisal of the empirical merits of a research programme.

As a result of carrying out this theory appraisal it is judged that the Realist account of school effectiveness research (RASER) is the one that provides the most promising tools for taking the field forward by constructing explanatory theories of the mechanisms involved in school effectiveness. This is because its fundamental assumptions include many of the key sociological theories that can be used to refer to the dynamics of power –and other unobservable entities– within schools and between schools and society. A subsequent research question then follows as a consequence.

B. To what extent is it possible to adapt or develop a Realist methodology within or as a part of school effectiveness research?

To answer this question, in the third chapter of this thesis, an adaptation of the Haig's (2005a) Realist Abductive Theory of Scientific Method (ATOM) to school effectiveness research is developed and presented. ATOM is judged to be especially pertinent as it shares the ontological and epistemological commitments of RASER. The result of this adaptation is the assembly of a complex of specific strategies and methods that provides a guide to systematically establishing the existence of contextually-based robust data patterns and to subsequently constructing explanatory theories. Again, another research question result as a consequence.

C. To what extent can these explanatory theories be operationalised within this Realist framework?

The reason for raising this question is that, as will be noted, several SER *theorists* have gestured towards using theories such as those of Bourdieu but have made little attempt to show how to operationalise and defend the operationalisation of such a major theoretical architecture. To answer this question, as presented in the following three chapters, the ATOM methodology is applied in order to identify, justify, test and postulate theoretical explanations (through multilevel and structural equation models) related to the factors associated with the inequity patterns of lower-secondary education in Mexico. To this end, chapter 4 provides the preliminary information necessary to carry out the analysis of the empirical data, i.e. a detailed description of the main characteristics of the datasets used in this work and a theoretical justification for the inclusion of the variables involved.

The datasets used for this work were built around two tests (one for language and one for mathematics) applied to a representative sample of the students

who were finishing the lower-secondary education in Mexico in 2005: the Quality and Achievement Examinations (EXCALE by its acronym in Spanish). Both datasets include achievement outcomes and information about the context in which the students are embedded.

EXCALE tests were selected for the empirical analysis of this thesis mainly because they are accompanied by an extremely detailed set of information about students, their families, teachers, head-teachers, schools; and therefore represent one of the richest sources for the construction of theoretical explanations in the educational field. In total, the data set counted more than 500 items on context information. Furthermore, based on the principles of classical test theory and item response theory, the EXCALE tests adhere to rigorous quality standards, including: a clear definition of use and coverage, the use of rigorous procedures for design and construction of items and tests, the use of standardized procedures for administering the test, and the exhibition of evidence of validity and reliability (Cf. Backhoff, Sánchez, Peón, Montoy, & Tanamachi, 2006).

Now, the procedure followed to establish a link between the theories and this empirical data resulted in the operationalisation of the theoretical framework in quantitative terms. Once done, the application of the methodology proposed is divided into two stages: the establishment of contextually-based robust data patterns and theory construction. In this way, the main research question stated above is divided into five analytical questions:

1) What percentage of the variation in educational achievement is due to differences between federal states, schools and students?

2) What characteristics of each level (i.e. states, schools, and students) have a significant effect on educational achievement?

3) Do the effects of these factors remain constant across different socio-economic and cultural contexts?

4) Do the effects of these factors on educational achievement differ across schools? In other words, are there some schools more equitable than others in terms of the characteristics evaluated?

5) Based on the answers to the previous questions: what theoretical models can be proposed to explain the inequity patterns in the distribution of educational achievements?

The first three questions are concerned with identifying the structure of the factors that influence educational achievement through multilevel modelling and will work as the basis for the empirical analysis. The fourth question, which also uses Multilevel Modelling, focuses on revealing inequity patterns in the distribution of the factors identified across schools; and the fifth question is concerned with proposing underlying theoretical models to explain these patterns through Structural Equation Modelling.

At the same time, the first four questions can be identified as elements of the first stage of the proposed methodological approach; i.e. Establishment of Contextually-Based Robust Data Patterns, and are addressed in chapter 5. The fifth question is addressed in chapter 6 and corresponds to the second stage of the methodology proposed; i.e. Theory Construction.

Finally, by way of conclusion, a synthesis of the main results of the application of the methodology proposed and a discussion of the results for the main research questions is presented.

2. School effectiveness research: a review of criticisms and some proposals to address them.

This chapter engages in theory appraisal by contrasting and comparing three research programmes that provide varying approaches to the question of school effectiveness, these are: the School Effectiveness Research Programme (SER), a Realist Approach to School Effectiveness Research (RASER) and a Practitioners Approach to School Effectiveness Research (PASER). The aim of theory appraisal is to judge which research programme might provide the best way of understanding school effectiveness. On the basis of this appraisal the research programme considered the most promising will be adopted in order to analyse the data set utilised in this thesis.

This chapter is structured by following Lakatos' (1970) notion of research programmes. Thus a brief review of its main concepts is presented first, which provides a template for the analysis of the theoretical structures of the three different approaches to school effectiveness considered. Lakatos's concept of research programmes has been used widely in the social sciences and in particular in education (Harris, 1979; Lauder, Jamieson and Wikeley, 1998). It provides a fruitful way of providing a structure whereby theories can be appraised. Theory appraisal is always difficult but the use of Lakatos provides a basis for a comparison of theories with different assumptions and world-views.

2.1 Lakatos' notion of research programmes.

According to Lakatos (1970), a research programme consists of three main parts: a hard core, a protective belt and a positive and negative heuristics.

The *hard core* consists of very general hypotheses that give the research program its essential characteristics and bedrock assumptions.

The *protective belt* is a set of auxiliary theories underlying and protecting the hard core from falsification, this part of the research program, can be changed or adjusted as a result of anomalies or empirical challenges without abandoning the program itself.

The heuristics (positive and negative) are a set of rules or hints about how to treat the hard core and the protective belt in order to aid discovery or invention. The negative heuristics state what the scientists are advised not to do, for example that the hard core of the program should not be abandoned or modified. On the other hand, the positive heuristics specify what scientists should do within the programme – what issues they should address, in what order – for changing or adjusting the protective belt.

Finally, according to Lakatos, the major indication of merit of a research programme is to what extent it leads to novel predictions or explanations that are confirmed. In this way, a progressive research programme is the one which remains coherent between its hard core and protective belt and eventually leads to novel predictions or explanations (theoretical progressiveness) that are subsequently corroborated (empirical progressiveness), whereas a degenerating research programme is the one that losses its internal coherence and/or is not capable to lead to novel predictions or explanations and/or is not capable to corroborate them.

In the social sciences, prediction is much harder to achieve than in the natural sciences so much of the focus of this appraisal is on the explanatory capabilities of the three research programmes and their implications for

policy. The issue of policy is significant in that the purpose of research into school effectiveness is in one way or another to change educational practice for the better, however the later is defined.

2.2 The School Effectiveness Research Programme

2.2.1 The hardcore of the main stream tradition of SER.

The School Effectiveness Research Programme (SER) has been working for more than three decades on the improvement of education outcomes. However, SER has received several critiques related to policy, theoretical and methodological issues that have been part of a prolific debate about its boundaries and potentials. SER has now reached a point where it is necessary to review and evaluate the critiques made of it in order to guarantee the accomplishment of the goals originally set for it.

According to Lauder and colleagues (Hugh Lauder, Jamieson, & Wikeley, 1998: 52-53), a rational reconstruction[1] of the hard core assumptions underlying SER would be as follows:

1) Schools as organizations do have an effect on students' examination performance, independent of other social factors, e.g. social class, neighbourhood, etc.

2) These school effects are not caused by chance and the effects that improve school performance in relation to examination success can be engineered on the basis of SER findings.

[1] The term of rational reconstruction was coined by Lakatos (1970) and refers to a reconstruction of what the researchers have logically and historically been committed to, independent of their own thinking, that is to say that it is not necessarily related to what researcher believe and their personal commitments (Lauder et al, op cit).

3) Schools are like any other organization where staff and children will respond to the systems, sanctions and rewards of a school so that successful re-engineering is possible.

4) Schools as organizations are structured as nested organizations. For example, central / local government serves as the broadest organizational structure within which there are different schools, departments, classrooms, etc. It is further assumed that schools' effectiveness can be identified by the analysis of the performance of each level and by the inference of the effectiveness of the relationship among all the levels.

5) There is a degree of relative autonomy among levels and between the education system and society. Therefore, schools can generate effects independent of many of the factors external to the school that may impinge on examination outcomes.

2.2.2 Critiques posed of SER.

There has been a long debate within SER and a vast, almost endless debate among critics and defenders of this programme. Fortunately, there are some outstanding compilations of criticisms and counter-criticisms that create order from the many strands of the debate. Among the criticisms, the books of Slee et al (1998) and Thrupp (1999) are particularly notable. As for the defence of SER, Teddlie and Reynolds (2001) have written a concise position paper.

There are several strands to the criticisms of SER. These can be classified as follows: objectivity concerns, lack or limitations of theory and methodological issues. Among these issues, the most common critiques have to do with concerns about the objectivity of SER, that is that it is too close to the presuppositions of policy makers and serves to legitimising their policies. However in order to understand this critique we need to look at both

its theoretical and methodological commitments in the light of the hard core assumptions outlined above.

SER's Theoretical Problems.

The fundamental bases for the theoretical critiques of SER have to do with the lack of theoretical basis for the selection, operationalisation and explanation of the relations between variables. As the hardcore assumptions listed above show it is not that SER is without theoretical commitments, although at a very high level of abstraction, rather it is the nature and status of the variables used.

Selection, operationalisation and explanation of the relationship between variables

Authors like Coe & Fitz-Gibbon (1998) and Lauder et al. (1998) claim that the inclusion of the variables considered by SER are justified more on statistical than theoretical grounds, and that the selection of variables is based on no more than common sense. For example, various measures of socio-economic status have been used in SER studies. These measures may be simple to operate depending for example on occupation, income and/or education but arguably they also lose important information that a more developed account of social class may give. For example, the degree of autonomy that parents have at work may be important to their children's education (Kohn, 1989). However this dimension of class may be obscured by measures of occupation since under the same occupational classification some jobs may provide greater autonomy than others. Moreover, it is taken as given that some measure of socio-economic status is important rather than a detailed justification being provided.

Furthermore, Coe & Fitz-Gibbon (1998) accuse SER of "fishing for correlations" between particular factors associated with school effectiveness and particular characteristics of schools, without specifying *why* or *how* it is

expected these particular characteristics may be related to school effectiveness.

An example which exposes this problem can be found in the notion of *school climate* adopted by SER. This is a key concept for this research programme since once a set of factors have been identified as producers of school effectiveness it is necessary to organize them around a concept capable to put the constituent parts of the recipe together, *school climate* seems to do the trick (Hugh Lauder, et al., 1998). The notion of climate admits that it can vary across schools, and it is also admitted that it can influence the role of teachers and students; yet there is no theory to explain how it is created or how it interacts with actor's performance (Lauder et al, *Op. cit.*). Take for example that "a good school may be found to have high expectations of its students; but those high expectations may be a result of having a good student intake over a number of years who are likely to produce good results" (Davies, 1997: 33). Another hitch that can be seen in the notion of climate, which is commonly seen in other concepts developed by SER, is that usually it is defined by an arbitrary selected set of items in a questionnaire that varies greatly among different studies (Miller & Fredericks, 1990).

Another criticism related to the selection of the variables considered by SER relates to the hard core assumption that schools are relatively autonomous from society. In particular that claims made about what can be achieved in school may in fact be context dependent (Luyten, Visscher, & Witziers, 2005). For example, in a study of four schools in deprived areas Lupton (2004) shows that schools which may appear similar in terms of disadvantage can produce different exam results because of the way they relate to communities.

There is also a set of variables that have been often omitted by the SER. Thrupp (2001b) for example, refers to composition of student populations within schools and their effects on school policy and curriculum practice. SER very rarely takes curricula into account seeing the school in managerialist terms (Lauder et al, 1998) in which good management and teaching are key

factors to school exam outcomes. Yet Thrupp's ethnographic approach suggests there is a relationship between pupil compositions in working class schools and the attenuation of their curricula as they seek to simplify what is learned. In turn this raises fundamental questions about the hardcore assumption that schools are relatively autonomous from context since Thrupp's (1999) research suggests that context in terms of social class permeates the school.

A further criticism that is consistent with the claim that SER is a research programme that supports current policy concerns the dependent variables typically used in SER research. Authors like Slee et al. (1998) and Bosker & Visscher (1999) argue that school performance is measured using scores of student achievement in basic skills (e.g. comprehension and mathematical skills), without considering a broader set of objectives. At this point it is important to say that even when there are studies that use non-cognitive dependent variables (See for example Cervini, 2003; Kyriakides, 2005), they are not common in SER. The reason why this focus on test results as the dependent variables is seen as consistent with policy is because in Britain the government has staked much on raising test results: what Lauder, Brown, Dillabough and Halsey (2006) have called the state theory of learning.

Finally it should be noted that while theory is remarkably absent from SERT at the level of explaining correlations there is acknowledgement in some studies that social theories might have a role to play, for example those developed by Bourdieu, Bernstein and Boudon, among others when justifying the inclusion of context variables in their analysis (v.g. Cervini, 2003; Tabaré Fernández, 2003a, 2003b; Taylor, Muller, & Vinjevold, 2003). However, these theories are not integral to the analyses but rather are used as a form of legitimation for the variables included and consequently they rarely use these theories to explain, in depth, the relationships between the independent variables and the school outcomes.

SER's Methodological Problems.

Underlying these theoretical problems is the question of SER's methodological, including epistemological commitments. One of the reasons it has been claimed that SER is a-theoretical is because it is seen as empiricist.

Is SER empiricist?

On this account what is 'real' for SER is what can be observed through the various forms of largely quantitative data that is assembled in SER research. As a result, this methodological and contextually reductionism is seen as a consequence of the fact that "[SER] implicitly builds upon a positivistic[2] social science when establishing conclusions about input–output relationships" (Wrigley, 2004: 231).

The critics point out that SER's commitment to positivist methodology necessarily entails a non-explanatory approach to the study of effective schools. Firstly, because positivism denies that social reality is differentiated and structured, therefore it deals only with constant conjunctions of observable events (Willmott, 1999b). Secondly because, as Willmott claims, the statistical modelling techniques commonly used by SER are problematic "since their language is acausal and astructural [*sic*.] …the concept of variable, for example, is indifferent *vis-à-vis* causal explanation: variables can only register change, not its cause" (Willmott, 2003: 131). In making this claim Willmott is explicitly rejecting a Humean view of causation which is discussed below.

According to Luyten et al. (2005), one of the main objectives of SER is to establish or identify malleable (measurable) factors that enhance school performance. In the mainstream tradition of SER these factors are obtained by analysing sets of correlations between directly observable and measurable variables, so the factors showing correlation with high school

[2] Although positivism is a particularly rigorous form of empiricism these terms seem to be used interchangeably. I will follow this practice.

performances can be certainly said to be associated with school effectiveness, but not to cause them.

Another point that has been emphasised is the essential atomist ontology that positivism presupposes. From this point of view, it is almost impossible for SER to see society as a whole and the interactions between wider social structures and the school (Willmott, 1999b). The problem is that positivism cannot admit of concepts such as social structure because they are often not observable, rather what we 'see' are observable manifestations of structures. But the concept of structures cannot be reduced to individuals; it requires other social entities to be admitted into the ontology. However, this raises further problems for SER because it has a Humean-based positivist view of causation that presupposes people are passive sensors of given facts which entail individualist explanations of society (Bhaskar, 1979). In turn this view of causation has implications for the hard core assumption that human beings are essentially passive in the sense that they will respond to incentives and sanctions.

According to these criticisms, to address the problem it is necessary to move the analysis to a more conceptual level. As Willmott points out "[a]t present, the field of educational research internationally is witnessing a pragmatist trend, whereby practical education research is being carried out without reference to ontological and epistemological concerns" (Willmott, 2003: 128). Reynolds, referring to SER, confirms this idea when saying "…precisely because we do not *waste* time on philosophical discussion or on values debates, we made rapid progress" (Reynollds in Thrupp, 2001a: 447). According to the critics the elements to move forward educational research can be given by a realist methodology, largely because it has greater explanatory power than that provided by SER.

Politics and School Improvement on the Basis of SER.

We have seen that critics have argued that SER is the servant of current politics and policy in Britain because of the focus on cognitive outcome

measures. However, Thrupp (2001a) and Wilmott (2003) provide further arguments of this kind and they relate to SER positivist methodology. Thrupp argues that the failure to take into account the permeability of social factors such as class in schools has led to the focus on education as the solution to social problems when in fact what needs to be addressed are questions of class and poverty. Although, clearly education has a role to play, education in this account is then seen as the focus of blame when it cannot deliver on the political agenda of greater social mobility for working class children (Thrupp, 1998).

Wilmott's methodological critique is related to this because he argues that a positivist methodology cannot take into account underlying causes, for example, power relations and their impact on schools. In these ways SER's approach is 'technicist' (Thrupp, 1999) or praxiological (Bhaskar, 1979): that is, that the research is a servant to policy makers. Sentence deleted.

In addition to these claims about the political bias in SER there are also related factors concerning the recommendations that SER makes. Here the focus has been on how to improve low performing schools, typically working class schools, .by encouraging them to adopt the characteristics detected in effective schools, typically middle class schools. Here critics have argued that this attempt will be unsuccessful because schools differ so much in relevant aspects, such as the causes underlying their specific performance, capacity for change, contextually characteristics, etc. One-size-fits-all solutions cannot be used, it is argued, instead school improvement efforts should carefully consider the ''power of site or place'' (McLaughlin, 1998; Miles, 1998). These differences are stressed when considering the practices of importing school effectiveness models from one country to another: a point which is germane to this thesis.

2.2.3 The protective belt of the mainstream tradition of SER

This section of the chapter is mainly based on the article written by Teddlie and Reynolds (2001) to address the criticisms of SER contained in two books: Slee and Weiner with Tomlinson (1998) and Thrupp (1999). The format of the paper is in the 'Point: Counterpoint' style and presents a series of 14 criticisms of SER followed by the counterpoints, which range from simple statements of agreement to vigorous defences. The importance given to the work of Teddlie and Reynolds relates to the title of principal gatekeepers of School Effectiveness conferred on them by authors like Wrigley (2004) because of their key role as editors of The International Handbook of School Effectiveness Research (Charles Teddlie & Reynolds, 2000).

Given that the criticisms of SER can be categorised as political, theoretical and methodological, it is within these categories that Teddlie and Reynolds (T&R) respond. However, it can be argued that the key issue concerns methodology and that it provides the framework within which issues of theory and politics have been debated. As regards theory, as we have seen, there are assumptions that SER makes and the argument might better be seen not as an absence of theory but about the type of theories that SER employs. The Realist analysis of Willmott (1999) is about the absence of theories relating to power that underlie the dynamics of school-society relationships. In contrast, SER has relied heavily on managerial theories about how to change behaviour to improve school effectiveness. But the issue of analysing power relations also relates to the politics because since SER has no critical analysis of power relation, arguably, it cannot challenge the fundamental inequalities that make school improvement difficult to achieve and sustain (Lauder, Jamieson and Wikeley, 1998). It is for these reasons that the key question turns on their methodological framework.

Regarding the alleged positivism of SER, even though T&R admit that *some* SE researchers work under the positivist paradigm, they disassociate themselves from both positivist and post positivist traditions, affirming that

they have assumed a pragmatic position, and explicitly claim that their research has the following orientations:

- Inclusion of both quantitative and qualitative methods for gathering and analysing data;
- Use of both deductive and inductive logic depending on the phase of the research project;
- Use of both objective and subjective epistemological approaches depending on the data being worked with;
- An axiology in which values play a large role in interpreting results;
- An ontology that accepts external reality, yet denies that truth can be determined once and for all.

When we look at this list above, there is some departure from the tenets of positivism but perhaps not as radically as T & R would claim. Firstly, positivism or empiricism allows for the possibility of qualitative work as part of the context of discovery rather than justification, in which qualitative work can be used to develop hypotheses that can then be quantified and tested. Depending on which form of empiricism is adopted naïve inductivism or hypothetic-deductivism, both forms of reasoning are possible under the umbrella of empiricism and it is quite possible that both forms of reasoning are present even in hypothetic-deductive forms of empiricism. Here a distinction needs to be made between the context of discovery and that of justification. It is quite possible that inductive reasoning could be used in the context of discovery; that is, in the development of hypotheses but that only deductive reasoning is employed in the context of justifying knowledge claims.

The claim of using both objective and subjective epistemological approaches points up the possible confusion mentioned above. It is not clear what is precisely meant by these terms but they appear to correspond to quantitative and qualitative methods. However, it is quite possible to argue for a unified realist epistemology that can incorporate both quantitative and qualitative methods (see e.g., Haig, 1988). This suggests that implicitly T & R are

assuming a distinction between quantitative and qualitative studies based on the empiricism –non empiricism distinction, rather than seeking a methodology that might embrace both forms of method. Their final two points are equally confusing. If an axiology embraces values as a basis for interpretation, then on what epistemic basis is that possible? Balarin (2008) has developed such a position based on a particular account of Realism but no basis is given in the T & R defence for this claim. Finally, they seem to adopt a vague post-empiricist falsificationist account of knowledge and truth claims, which would not be consistent with empiricism but how such a claim fits with the eclecticism espoused in this paper is not clear.

This discussion suggests that the defence of SER is not based on a methodologically coherent account of a research programme and as such T & R might need to consider giving up the claim that it is. However, one way in which quantitative and qualitative research can be understood within a consistent methodology is through a particular version of realism advanced by Haig. But neither the philosophy or practice of SER's quantitative and qualitative work embraces Realism or the theoretical postulates that might be considered Realist as will be discussed below.

The analysis of the critiques and counter-critiques presented above invites us to consider potential alternative research programmes to SER. To do that, in the next part of this chapter two alternative approaches are characterised in terms of the Lakatosian notion of research programmes. It will be apparent that many of the criticisms of SER have come from a Realist perspective and the next research programme to consider is one termed a Realist Approach to School Effectiveness (RASER) (Hugh Lauder & Brown, 2007). This programme, which builds on the paper by Lauder, Jamieson and Wikeley (1998), sets out to detail what the methodological implications of research into school effectiveness are.

While RASER relies on the naturalism of critical realism in suggesting a methodological unity between the natural and social sciences, the third research programme which is called the Practitioners' Approach to School

Effectiveness Research (PASER) suggests a radically different approach. Ball (1998) has argued that: “Schools are complex, contradictory and sometimes incoherent organisations like many others. They are assembled over time to form a bricolage of memories, commitments, routines, bright ideas and policy effects. They are changed, influenced and interfered with regularly and increasingly. They drift, decay and re-generate” (Ball 1998:317).

From this perspective schools are not coherent organisations and therefore it is hard to see how research into *school* effectiveness is possible. In making this claim Ball is sketching an alternative account of schools but an underlying justification for his position comes from Stables (2003). Stables argues that the meaning of school and effectiveness must be dependent on actors’ perceptions and research evidence related to these perceptions comes not as data or phenomena that can be quantified (Stables, 2003); furthermore, he argues that, as conceptual entities, actors are not only unique but have multiple and changing selves. This post-modern critique echoes Lather’s (1991) critique of quantitative methods in the social sciences. Taking a similar view of individuals and meaning to that of Stables, she argues that quantitative research fundamentally misrepresents the nature of individuals because they cannot be seen as ‘averages’ and especially since the notion of the self is dynamic and therefore of social interaction. Hence a different kind of approach such as that of PASER is required to understand the nature of the schooling experience.

2.3 The Realist Approach to School Effectiveness Research

2.3.1 The hardcore of RASER

This approach differs from the mainstream of SER in two important respects: i) in contrast to the empiricist methodology presupposed by the mainstream tradition, RASER has a critical realist methodology. ii) Consistent with this

methodology, the hard core and heuristics suggest that the degree to which schools can have educational effects independent of the wider society is a matter of theoretically driven empirical investigation of a kind which is precluded by the empiricism of traditional SER.

In this way, a rational reconstruction of the hardcore of RASER can be condensed into the following six postulates.

1) Some explanations about school processes and outcomes are based on unobservable mechanisms. This can be understood in two senses: effects in school may be observed but their causes may lie outside schools (e.g. cultural / social capital); and in terms of contradictions between schools' policy/management and the broader educational policy which may produce tensions (unobservable mechanisms) that have an actual impact on the school outcomes (see the discussion below). In the first case what is unobservable are elements in a web of relationships, which in principle may be observed but for practical reasons cannot; while in the latter case the tensions are in principle unobservable but may nevertheless have real effects.

2) Unobservable mechanisms can only be postulated through theory.

3) Schools are structured as multilevel organizations. However, in multilevel statistical analyses it is difficult to know how to explain effects at any given level. In this respect MLM analyses can only be a precursor of other forms of investigation, i.e. qualitative. Here an initial unobservable cause may be subsequently revealed and even distributed/allocated among the levels considered in the analysis by further analysis and theorisation.

4) Therefore, causal mechanisms have to be explored not only by quantitative techniques but also through detailed qualitative research. Numbers in themselves are inadequate, and need to be complemented by an 'explanatory narrative' (Nash, 2002). An

explanation has to be provided to identify that the connections between cause and effect are not merely accidental by locating possible causal mechanisms; the discovery of regularities/phenomena is only a starting point: the scientist must move immediately to the construction of possible [theory driven] explanations, which can subsequently be tested out. In particular, the investigation of generative causal mechanisms is important because they produce the empirical data patterns of regularities that are observable.

5) Schools' capacities, potential and limits determine their influence over the students' attainment. At the same time, these capacities, potential and limits are determined by the social and political context in which schools are embedded (Lauder at al., 1998).

6) Schools are not independent of their context, so the concepts to explain the nature of schools and their performance must include the so-called border concepts, such as the student sub-cultures and the wider sub-cultures that link the schools with their context (Lauder at al., 1998).

2.3.2 The protective belt of RASER

The next section of this work analyses the auxiliary hypotheses that have been developed by the authors within RASER to protect its bed-rock assumptions.

As it was explained before, one of the main critiques of SER is the extent to which it relies on *common sense* and/or *tacit knowledge*. Thus, one of the main characteristics of RASER is its claim for theoretically driven explanations for school processes and outcomes making explicit the relations between theory and data.

This approach is realist in ontological and epistemological senses, that is to say that the way in which reality is understood is determined by the best theories available at a given time; and in the epistemological sense refers to the idea that theories can postulate unobservable mechanisms or characteristics that explain observable phenomena (Lauder & Brown, 2007).

Lauder and Brown (2007) discuss the warrant for knowledge claims within RASER by using the concepts of explanatory depth and breadth. By explanatory depth they mean that explanations will posit unobservable mechanisms that frame the responses that schools make. This mechanism refers to the idea of tensions that may cause a change in practices and dispositions of teachers, students and staff in a given school.

The authors give an example about a British working class primary school which prides itself on having a range of policies and resources to deal with disadvantaged students. Nevertheless, its score tests are below what is expected by the ruling testing regime for a school with its characteristics. Thus, the local advisor has recommended the school to focus on the students with higher attainment (who, of course, are not the disadvantaged ones) in order to raise the level of the school in future testing scores. This has provoked a tension within the school, as the staff feel that a genuine education for the disadvantaged has to be sacrificed to the testing regime. In this example government policy and the aims of the school are shown to be in clear tension, which has generated changes in practices, dispositions and conflicts among staff.

Another example of the warrant of explanatory depth can be given in the Mexican context. The Programa Escuelas de Calidad (Quality Schools Programme, PEC) is one of the current public policy programmes in education of the Mexican government. It is supposed to address the quality of schools from a school and classroom-centred perspective (Santibañez, Vernez, & Razquin, 2005). PEC provides cash incentives for schools to develop and implement their own improvement plans. Among other requisites, PEC requires schools to develop those school development plans

with inputs from teachers, parents, students and school staff (what, in terms of PEC, is called the *amplified school community*). Participation of the amplified school community in developing the plans is indispensable to get access to the economic resources. Now, according to Mejia Botero (2004), if the community in which the school is embedded happens not to be participative, the simulation of participation becomes a common practice in order to secure resources for the school's needs. Then, when the whole amplified school community realizes that the plans were developed without taking into consideration their opinions (even though they were meant to participate) tensions are created within the school, affecting practices and dispositions of all the implicated. In this case the aims and requisites of the programme (promote community participation) are in patent tension with the actual culture of the school and its community, generating undesirable results. The key point in this example is that this tension may not be explicitly recognised or interpreted as such by the various parties, while the consequences of a non-participative community may have many different effects in schools for which the sources of the tension remain unrecognised. Schools may blame parents while parents may be in awe of the school and it may be these attitudes and accompanying practices which underlie the tension.

Now, going back to Lauder and Brown's analysis, the second concept coined by them to explain the warrant for knowledge claims within RASER is explanatory breadth. The authors refer to the problem of compositional effects to show the significance of explanatory breadth. Recently, the debate about the significance of schools' compositional effects has been intensified. At present, there is a trend to re-consider the importance of compositional effects. Quantitative studies like those of Sammons et al. (1997), Opdenakker and Van Damme (2001), Fernandez and Blanco (2004) or Cervini (2006) have found significant compositional effects, however, most of these studies relate the compositional effects only to peer effects. Lauder and Brown emphasise the importance of qualitative studies that illustrate how the compositional effects may work. This qualitative evidence suggests such

effects may influence pedagogical and management processes (Gewirtz, 1998; Ruth Lupton, 2005; Thrupp, 1999).

In this way, according to Lauder and Brown, the theory of compositional effects attains explanatory breadth by hypothesising that the nature of school composition could influence school outcomes not only through peer subcultures but also through pedagogical and management processes.

Analyses of the kinds described above require both quantitative and qualitative data to be able to produce claims attaining explanatory depth and breadth. Quantitative data is needed to establish the existence of *symptoms* (e.g. compositional effects) and qualitative data is necessary to explain the mechanisms underlying them (e.g. tensions, missing elements in a web of relationships). Now, neither tensions nor the missing elements in a web of relationships can be observed (only their symptoms), therefore in order to consider them in the analysis they have to be theorised (Hugh Lauder & Brown, 2007).

In this fashion, the goal would be to construct a theoretically informed account in which the quantitative and qualitative methodological elements are recognised and included in an explanatory narrative of the educational processes (Nash, 1999b).

Given the multilevel structure of school organizations and systems, an explanatory narrative considering quantitative and qualitative methodological elements will also make it possible to distribute the ‘praise’ and ‘blame’ of educational outcomes between the different levels considered in the analysis. In other words, even when one of the main features of MLM is to assign a percentage of the variation in the dependent variable (e.g. school outcomes) among different levels, it does not mean that causal relations can be established in the same way. In this respect MLM analyses can only be a precursor of other forms of investigation, i.e. qualitative. By this token, the causes of the *symptoms* may be distributed / allocated among the different levels considered.

2.4 The Practitioners Approach to School Effectiveness

2.4.1 The hardcore of the practitioners approach of SER

As we have seen PASER takes a radical post-structuralist position on education and its main focus is on addressing inequalities. Its main differences respect the previous two approaches can be derived from the next statements: i) Inequalities can only be overcome by a fundamental change in schools and the associated power relations; ii) This can only be achieved through teachers or practitioners because only they have an understanding of the culture and power relations of the school. They are reflexive insiders in this respect. (iii) Practitioners' participation in research has to be strengthened to avoid misinterpretation and reproduction of dynamics of inequality when applying the research programme and; iii) Quantitative data is not appropriate to make evaluative judgments about schools for the reasons given previously.

While schools might be the focus for alleviating inequality, the school itself may be an organisational shell in that the power dynamics within it may pertain to only certain aspects of it because as Ball (1996) suggests, the school is a bricolage of various elements.

Hence, the fundamental assumptions of PASER would be as follows:

1) Schools are historically complex systems and "the configuration [of this kind of system] is organised through the inter-definition and interaction of relations and conjuncts of relations" (Gonzalez-Casanova, 2004: 99) of all the actors involved.

2) Schools as systems have an effect on student outcomes and that the effects that improve school performance can be obtained on the basis

of research by integrating the practitioners' view and by having units of analysis that allow schools to recognise and develop their internal effectiveness.

3) The school and its context share rhizomatically the factors that cause the school outcomes. A good example to have an image of a rhizome is to observe the roots of grass. It is impossible to know which root corresponds to which grass, but each grass has roots and they all are interconnected. Those multidimensional networks lie under the surface of all conceptual entities (Deleuze & Guattari, 1972).

4) Any research initiative intending school improvement must include the practitioners' perspective. It is necessary to strengthen practitioners' participation to avoid misinterpretation and reproduction of undesirable dynamics (e.g. inequality) when applying a research programme. As practitioners are real experts, they must participate in evaluating their own practice, producing explanations of the school processes, and in the definition of school effectiveness.

5) Research within this programme must exclusively use a qualitative approach as this is the only approach that can give an exact account of the relations between school and context. The meaning of school and effectiveness must be dependent on actors' perceptions and research evidence related to these perceptions comes not as data or phenomena subject to quantification.

2.4.2 The protective belt of PASER

Some hypothesis have been developed that might protect these hardcore assumptions from falsification. These hypothesis can be exemplified by reviewing the next three problems identified by authors within PASER in SER and RASER practices: i) the problem of reifying concepts; ii) the problem of

the agency of practitioners; iii) the problem of giving school communities the power of defining and assessing their contextual factors and keeping generalisable units of analysis; and iv) the problem of using quantitative approaches to analyse complex social systems.

The problem of reifying concepts. "The idea of 'reification' refers to the mental process of making something fixed, or thing-like, when in reality it is the outcome of a particular kind of social relationship" (How, 2003: 63). An example would be the notion of school and context. A very common way of reifying an idea or object is to consider two abstract notions and establishing a dichotomy. However, in the context of PASER school and context cannot be dichotomised as they point to a set of complex processes that are interacting with one another –which is what constitute them as conceptual entities. It would only be under SER, where there is the hardcore assumption of the relative autonomy of the school from context that we could consider the two as relatively separate entities. Moreover, if we look at the school-context dichotomy in causal terms as is presupposed by SER (within the rubric of relative autonomy) context *causes* at least part of the observed school outcomes. But according to PASER even if there is an original cause, it is not relevant in complex systems, where if one point is affected the whole system will be affected (Byrne, 1998).

Paragraph deleted.

This model of causation refers to the allegory of the rhizome explained in PASER's hardcore. As mentioned before, according to Deleuze and Guattari (1972), those multidimensional networks lie under the surface of all conceptual entities; thus, the school and its context would share rhizomatically many factors such as the reproduction of inequalities. In this fashion, schools are seen as complex systems existing in discursive rather than physical geographical space, thus the meaning of *school* and *context* depends on its actors' perceptions.

At the level of the school the actors that constitute it, have inter-definitions and interactions with the actors that shape what is called context. In this sense the concepts are best understood, not in terms of the causal relations between them but as a way of actors making sense of and keeping manageable some aspects of reality.

Authors within this programme recognise that researchers and school communities have agency and claim the need for all actors implicated in education to work on questions of improvement, focussing on inequality, within the existing socio-political system. Using this argument, PASER states that improvement can be achieved assuming that the nature and change within school is always 'becoming', because as the agents that comprise schools, schools are human artefacts that can potentially reproduce and transform reality by transforming themselves through the agency of teachers and students.

However, as Deleuze and Guattari advised, the determinations of conceptual entities –such as school, context and effectiveness– are coded by power because, among other explanations, those who are powerful feel legitimacy to construct identities and interpret the desires of those on whom they exert hegemony. Thus, if researchers use interpretative approaches they might be reproducing those dynamics that supposedly they are hoping to avoid. This leads to the second problem: the problem of the agency of the practitioners.

The problem of the agency of practitioners (empowering practitioners). As a starting point, it is fundamental to underline that PASER considers that the construction of agents identities is a process that is always produced in relation to others, and that stereotypes can be attached to processes of reproduction of inequalities (Barrón-Pastor, 2007). Homi Bhabha (1994) argued that "an important feature of colonial discourse is its dependence on the concept of 'fixity' in the ideological construction of otherness" (Bhabha, 1994: 66). This 'fixity' is basically a stereotype, the construction of identity not by the other, but about how dominant discourses construct those supposed identities, where the 'ours' usually have positive connotations and the 'others'

are often associated with negative values (Pickering, 2001). Legitimating processes occur by fixing identities through the ideological construction of otherness (Bhabha, 1994). In this sense, interactions might reinforce inequalities if 'experts' construct the problem, debate it and determine a solution without considering those who are being affected by those dynamics (Spivak, 1999). Moreover, authors like Barron-Pastor (2006) affirm that the 'problematisation' of 'others' could be a 'superior stage of stereotypes' in very elaborate ways.

Following Barron-Pastor, it is necessary then to examine through research if the breaking of stereotypes can be achieved through deepening interaction between agents (Barrón-Pastor, 2007), and whether this interaction can take the form of an egalitarian dialogue or whether it is subordinated to the dominant rationality (Irigaray, 2002).

Thus, dominant cultures establish diagnostics about how schools should be and how important the context is according to their own cultural references. But these diagnoses might not apply to other cultures. In this respect, it is because SER establishes the terms of 'effectiveness' that this research programme is under fire since it is alleged that problems and contexts are defined by a hegemonic power as a research programme that claims neutrality while continuing the reproduction of inequalities (Thrupp, 1999).

It is possible to propose this theoretical inversion for the so-called developing countries. Developing countries do not pretend to copy the education systems of developed countries for which the SER research programme has created models that reproduce inequalities. Most of authors from developing countries agree that avoiding the reproduction of inequalities is a priority, and that a crucial necessity of schools is to develop tools to do it effectively. It seems that if we approach the notion of context as an external reality for schools, what we may be also doing is reproducing those dynamics that reinforce inequalities instead of using schools as ways of prevention for those undesirable dynamics. In other words, one of the key elements of PASER is

that it rejects the dominant models of schools such as that found in the hardcore of SER.

This leads to the third problem mentioned above, the problem of giving school communities the power of defining and assessing their contextual factors.

The problem of giving school communities the power of defining and assessing their contextual factors. As stated above, according to PASER, stereotyping is a way of reproducing inequalities and these inequalities are reproduced by complex power dynamics (Gonzalez-Casanova, 2004). To avoid stereotypes it is necessary to allow practitioners to define their school contexts as they see them. Stables (2003) argues that schools are better understood by those who act within them and that policy-makers, for example, with only a researcher's interest in any institution, are less well placed to make decisions about particular schools that those on the ground. Currently the Children as Decision Makers Academic Group[3] intends to study how children and students in general can actively participate in decision making in schools.

Underlying these points there is an agenda about the role of researchers and the recognition of the actors' agency. The ideas outlined above, concur with Lather's arguments about the position of researchers in a democratic society. In this way, the role of the researcher would be to serve as a facilitator in a democratic discussion that allows all actors' voices to be heard (Lather in Lauder, Brown, & Halsey, 2004).

In order to support participants in their reflections and deliberations training can be taken in relation to Action Research. Action Research is a community-based technique that allows capacity building for all participants, "acknowledges the limitations of the knowledge and understanding of the 'expert' researcher, and takes into account the experience and the

[3] More information can be obtained from http://www.childrenasdecisionmakers.org/

understanding of those who are centrally involved in the issue explored –the stakeholders" (Stringer, 2007). Jack Whitehead, one of the founders of this technique, claims that practitioners can investigate their own practice, produce their own explanations that can be constantly tested by the critical responses of others, and gain validity by "showing the authenticity of the evidence base, explaining the standards of judgement used, and demonstrating the reasonableness of the claim" (Whitehead & McNiff, 2006: 98).

But how is the agency of practitioners going to be recognised if the research programme excludes them from goal stating, achievement, and evaluation processes? The key point about SER from this perspective is that its analyses are expert rather than participant driven. On the basis of quantitative and qualitative analyses schools are 'told' how to improve.

In Mexico, this is a particularly pressing issue because while there have been some recent efforts to link the effectiveness of education to those policies focused on poverty reduction (c.f. Flores-Crespo & De la Torre, 2007) these latter studies have shown that even though these policies have been good at raising school enrolment and attendance levels, they have not produced quality and equity of opportunities in education (Cervini, 2002; Tabaré Fernández, 2003a; Sandoval-Hernández, 2007; Sandoval-Hernández & Muñoz-Izquierdo, 2004).

The problem of using quantitative approaches to analyse complex social systems. Given the complexity of the actors and their relationships discussed above, is it possible to design models of school effectiveness that truly take account of actors' perspectives? From PASER's perspective it is possible and the only way to address this challenge is through an exclusively qualitative approach. The rejection of quantitative research within this programme is supported by arguments of authors like Lather (1991), because her account link together issues of methodology and the position of researchers in a democratic –thus, participative and equitable– society (Hugh Lauder, et al., 2004); or Stables (2003) whose conception of schools as

imagined communities fully concurs with the notion of conceptual entities stated in the hardcore of PASER.

According to Lauder and colleagues (2004) a reconstruction of Lather's position regarding quantitative methods, would point out that statistical analyses has at least two problems. The first is that any attempt to refer to individuals as 'averages' will misrepresent them in crucial ways, since human beings are not only unique but have multiple and changing selves. The second is that the techniques commonly used by quantitative approaches for gathering data (e.g. questionnaires) represent a hierarchical view of knowledge since they imply experts to impose their meanings on others. Given that many sub-cultures have their own systems of meanings and are at the margins of society (e.g. indigenous peoples and ethnic minorities) the imposition of meaning through quantitative approaches represents another form of colonial dominance (Lather, 1991).

For Stables (2003), evaluative judgements about schools cannot validly be derived from statistical models as quantitative data alone cannot capture the undeniable range of experiences relating to any particular school, particularly given a lack of absolute consensus about educational values. He defines schools are complex systems existing in discursive rather than physical geographical space. In this fashion the meaning of school depends on actors' perceptions and these are different for each person. In this way, what schools are cannot be something objective susceptible of being measured in quantitative terms. The author claims that evidence relating to this kind of perceptions cannot come as data or phenomena with observable behaviour, but rather as phenomenographic fragments: pieces of described experience in permanent and constant change.

Now, if this concept of school is going to be taken, a first step is to recognise that there is a need for strengthening the qualitative tools currently available and developing new ones. More sophisticated qualitative tools are necessary to develop better units of analysis that would allow schools to define efficiency parameters and produce more suitable information for building the

theoretical basis of the programme. Action Research could be a useful tool to do this by involving actors in the research process and opening a new range of techniques for gathering and analysing information. From the categories developed by these techniques it could be established some units of analysis and have a vision, from a practitioner's perspective, about how inequalities and contexts are being affected by the action of schools.

One of the first critiques that can be posed against this view is that giving practitioners the power to define contextual factors and to assess their changes would result in such a wide and different range of variables that it would be impossible to systematically analyse or compare them. Nevertheless, producing qualitative data is a common and well established form to create categories for further quantitative research (Bryman, 2004), furthermore, following Habermas (1987), practitioners can be aware from the beginning of sharing some agreements to reach inter-subjective understandings aiming to share some units of analysis and to discuss those factors that are difficult or polemic to be categorised into the agreed units of analysis.

It is possible to see why PASER would be considered a response to the hegemony of SER in a post-colonial context such as Mexico. It can also be argued that whatever research programme for the improvement of schools is undertaken the views of the agents within the school are central. But does it provide a defendable approach in the Mexican context? Before addressing this question we should consider the heuristics of the three programmes.

2.5 Evaluating the Three Research Programmes

In order to evaluate these three research programmes we can use Lakatos' criteria to judge the progressiveness of research programmes as a guide. He argues that a programme A can be judged as more progressive than B if: i) A

leads to explain novel facts, that is, facts improbable in the light of B – theoretical progressiveness; ii) A can explain the previous success of B, that is, A contains all the non-refuted content of B and; iii) A can empirically corroborate its novel explanations –empirical progressiveness. It should be emphasised that Lakatos applied these criteria to natural science research programmes and they cannot be applied without qualification to the social sciences. In particular, while theoretical progressiveness is possible empirical progressiveness may not always be possible because of the differing variables and contexts in which data are collected.

If we start by comparing SER and RASER, then it is clear that in terms of theoretical progressiveness RASER is more progressive than SER. This is because it can postulate theories which encompass questions of power and other unobservable variables in a way that the Positivist SER cannot. This then opens the door for sociological theories such as those of Bourdieu's cultural capital for example, which cannot be understood without reference to the unobservable *habitus* in order to explain inequality in education. It was mentioned previously that SER researchers have referred to theories such as those of Bourdieu and Bernstein but in a vague way, which serves no explanatory purpose but rather uses them for purposes of legitimating. Moreover, RASER can through its positive heuristic consider ways in which context permeates the school and its outcomes in a way which would be forbidden under SER. It is significant in this respect that the focus on school composition has come largely from heterodox researchers into school effectiveness who have been Realist in their orientation, particularly in terms of their focus on social class.

By the same token by taking notion of tensions at the heart of schools as a basis for understanding key aspects of school life RASER has the potential to develop both explanatory depth and breadth. For example, if we see such tensions as a generative mechanism, then if the same tension occurs in a sub set of schools, it should be possible to identify similar outcomes with for example, in the case given above of a decline in school moral.

If RASER appears, at least more theoretically progressive than SER then what can be said of RASER and PASER? The key criticism that can be made of PASER is that agents may not be aware of the underlying social structures which create the framework of power within which they work. In other words, while such structures are open to theoretical and empirical investigation to see whether they exist and what form they take, this possibility may not be open to the agents within PASER. Moreover, RASER can explore data patterns (explanatory breadth) relating to social structures (for example the persistent inequalities between men and women with respect, to say, income) that could only be experienced phenomenologically within schools. It can therefore accept the significance of empowering communities such as schools. What is more, RASER's methodology can complement this point by providing tools to uncover the dynamics of power and the mechanisms of reproduction of inequalities.

However its seems crucial that agents' account of their schools is important, not only to gain a better understanding of schools but also as to how best to improve them. Can RASER address this issue? Recent work on the relationship between quantitative and qualitative research within a Realist methodology such as that of RASER has been developed by Haig (1988) and Fairclough, Jessop, & Sayer (2004). Haig argues in his Realist reconstruction of grounded theory that qualitative research can adopt the same methodology as quantitative –a point which is developed in the next chapter. Fairclough, Jessop and Sayer (2004) show how semiosis, (signs and symbols, including language) can be seen as part of the Realist position. Together these papers open up the possibility of qualitative research being undertaken with a Realist methodology. Moreover, case studies can reveal underlying causal mechanisms despite the particularities of the case. Returning to the example given previously, while one school may be very different in culture to another, a number of schools may experience the same underlying tension between the sense of teacher professionalism and the policy imperative to teach to the test. The culture of particular schools may mediate the effects of this tension but we might still look to see if there is some evidence of the tension in terms of teacher conflicts and moral. If not

then culture may be an explanatory variable in why these effects are not observed.

RASER can also take on board PASER's view of the possibility that SER imposes a form of colonial hegemony on how schools are understood in a country like Mexico. This is because it can admit of power structures such as colonialism and because the identification of structures can be seen as a preliminary to forms of political action it can also take into account actor's views. Moreover, it can also identify variables that may be significant in the Mexican context which are not significant elsewhere. Here the particular effects of poverty seen and unseen may be of relevance to understanding the limits and possibilities to school effectiveness in Mexico.

It is important to point out that most of the work made within RASER has been theoretical so far, thus more empirical research is needed to fully evaluate its scopes and limitations –empirical progressiveness.

Finally, it is also important to say that these arguments do not claim that SER and / or PASER should be abandoned to follow exclusively RASER. Not even when one research program is judged as degenerating and another as progressive does Lakatos suggests that researchers should only work on the progressive one. In other words, it is not irrational for some researchers to work on a young research programme if they think it shows potential. At the same time it is not irrational for some other researchers to keep on working on an old programme to try to make it progressive (Forster, 1998).

According to this, the next section of this work explains in detail the RASER's methodology, which will be used for this research.

3. Methodology. A Realist Theory of Scientific Method for the Study of the (in)equality of Educational Opportunities

In this chapter I present an adaptation of the Haig's Realist Abductive Theory of Scientific Method (ATOM). There are several versions of Realism for the social sciences and in this chapter I link Haig's theory with that of Critical Realism. The reason for choosing the former is that Haig provides both a sophisticated account of methodology but one which provides detailed prescriptions for the researcher. Critical reason is helpful because it provides an account of theory choice that ATOM does not provide.

In the previous chapter I analysed the structure of the School Effectiveness Research (SER) programme and reviewed the main criticisms that have arisen, stressing those regarding its theoretical limitations. The conclusions of this analysis point to the necessity of developing a scientific methodology that supplies tools for the construction of explanatory theories in the field. At the same time, it suggests a quite different approach to the positivism presupposed by the mainstream of SER.

The conclusions of this analysis also shows the relevance of the critical realist theory to frame such a methodological account, as its ontology assumes many of the key theories that might be used in this context to refer to the dynamics of power –and other unobservable entities– within school and between school and society.

3.1 The Abductive Theory of Scientific Method.

The Abductive Theory of Scientific Method (ATOM) developed by Haig (2005a) is especially pertinent, since it shares the ontological and epistemological commitments of the critical realist approach. According to its author, ATOM provides a guide to systematically describing how the existence of phenomena and data patterns can be established and then how theories can be constructed to explain their existence. ATOM proceeds in a data-before-theory sequence, claiming that the search for understanding empirical phenomena is what gives explanations point. In this sense, empirical phenomena exists to be explained rather than to be used as the objects of prediction in theory testing (Haig, 2005a).

The chapter is organised according to ATOM's structure, thus in the first part a characterisation of the nature of phenomena is given and the process of their detection is described in terms of a multi-stage model of data analysis. The second part concerns the construction of explanatory theories, which is presented as a multi-stage procedure too; theories are shown to be generated through existential abduction, developed by analogical modelling and judged in terms of the best competing explanations. Finally, some conclusions are presented stressing the usefulness of this kind of methodology to take the field forward by developing a more powerful account of schools and their effectiveness.

3.1.1 Presentation of ATOM.

According to its author, ATOM "…assembles a complex of specific strategies and methods that are used in the detection of empirical phenomena and the subsequent construction of explanatory theories. The construction of explanatory theories is shown to involve their generation through abductive, or explanatory, reasoning, their development through analogical modelling,

and their fuller appraisal in terms of judgements of the best competing explanations." (Haig, 2005a: 371).

Presently, scientists use a wide range of research methods and investigative strategies when doing research. Among them, the inductive and hypothetic-deductive accounts stand out. For the former scientific knowledge can be derived from empirical observation by a kind of reasoning which take us from a finite list of singular statements to the justification of a universal statement – inductive reasoning (Chalmers, 1994). For the latter method, scientific knowledge can be constructed by testing and confirming the predictive power of general statements (hypothesis and theories) against singular observations of empirical data –deductive reasoning.

However, following Haig (op cit), these methods are better thought of as restrictive accounts of method that can be used to meet specific research goals (Nickles 1987 in Haig, 2005a), rather than theories of scientific method capable of pursuing a range of research goals.

The theory of method to be used in this research is a broader account of research method than empiricist accounts employing either inductive or hypothetic-deductive methods. ATOM is meant to provide a guide to systematically describing how empirical data can be discovered and then how theories can be constructed to explain those data. Contrary to the hypothetic deductive method, –which takes a constructed theory and then gathers data to test it– ATOM proceeds the other way around., However, inductive and hypothetic-deductive methods can be incorporated into ATOM within a Realist framework.

3.1.2 Structure, sub-methods and strategies of ATOM

In very simple terms, according to ATOM, scientific enquiry is about explaining empirical phenomena through theories. That is, its basic structure

has two stages: phenomena detection and construction of theories to explain them. To complete each stage, ATOM proposes to use specific strategies and sub-methods, which are described next. However, as I make clear below, although phenomena are possible in the social sciences, they cannot always be established. In fact attempting to do so may violate some of the key elements of social science research such as the significance of context. Therefore, this research focuses on the establishment of contextually-based data patterns instead of focusing on phenomena detection.

Phenomena according to Bogen and Woodward (1998) are objective, stable features of the world; while data are ephemeral, pliable and context-dependant. In the social sciences an example may be Kontradief waves in which capitalism goes through booms and slumps or, closer to education, credential inflation. In both these cases explanations need to be sought for these abstract tendencies. It might be thought that the correlation between socio-economic background and school achievement is an example of a phenomenon but this would leave out context. Arguably both the examples from economics and sociology above may be able to generate meaningful explanations for these tendencies which are beyond context but in the case of the link between socio-economic background and educational performance this is not necessarily the case because such explanations also need to make reference to how socio-economic status relates to performance in contexts such as Mexico which might be quite different to those in Britain, for example. In short, theories attempting to be universal, typically seek to explain phenomena and not data. In the case of this research, what is attempted is to generate is not universal, but contextually-based theories.

3.2 Establishment of the existence of contextually-based robust data patterns.

A wide range of methodological strategies are used in order to establish the existence of contextually-based robust data patterns. Some of these strategies can be analyses including controlling for confounding factors, using comparison groups, statistical and non-statistical data analysis strategies, constructive replication of study results, etc.

Haig (op cit) proposes a multi-stage model of data analysis. This model includes four stages: initial data analysis, exploratory analysis, close replication and constructive replication. Each stage has a particular objective in detecting phenomena, namely: assuring data quality, pattern suggestion, pattern confirmation and generalization.

Here it is important to point out that ATOM was originally devised to be applied within psychological behavioural sciences; therefore some adjustments have to be made. In this case, based on the four stages of Haig's model and maintaining the objectives mentioned above, a slightly different model is proposed.

paragraph deleted

3.2.1 Initial exploratory data analysis

This stage consists in an informal examination of the data to be used before starting the proper analysis. It usually involves processing the data in a suitable way for the analysis by detecting and dealing with recording errors like missing observations and outliers (Everitt, 2001); examining the data for their fit to the assumptions of the statistical method to be used, for example whether the data meets the assumptions of parametric data (Chatfield, 1995); calculating summary statistics like mean, median, mode, standard deviation or variance (idem); and plotting graphs (Tukey, 1977). The aim is to

clarify the structure of the data and assure their quality and suitableness for the analysis intended.

Although within SER it is not very common to find explicit information about the procedures followed to cover this stage, the importance of these preliminary analyses is widely recognized. According to Bell (2001) "exploratory data analysis is regarded as essential before further analysis" (Bell, 2001: 1). Since it is well known that data lacking integrity can easily lead to the misuse of analytical methods and the drawing of erroneous conclusions, it is generally taken for granted that any serious piece of research carries out a preliminary analysis to assure the quality and suitableness of the data sets to be used. Within studies examining school effectiveness, due to the usual constraints on space in journals, examples of works showing their initial data analysis in a detailed way can be more frequently found in theses (e.g. T. Fernández, 2004; Liu, 2006; Sandoval-Hernández, 2005; Scherman, 2007) or in books/reports (e.g. Kristen, Römmer, Müller, & Kalter, 2005; Magriñá, 2003; Carlos Muñoz-Izquierdo, Márquez, Sandoval-Hernández, & Sánchez, 2004); nevertheless some journal articles do show their initial analyses (e.g. Cuttance, 1985; Klitgaard & Hall, 1975; Ma & Kishor, 1997; Schagen & Weston, 1998).

3.2.2 Core data analysis

Once the possible recording errors in the dataset have been dealt with, it has been decided which core analysis techniques will be used, and it has been checked that the data meet the assumptions of the selected statistical methods, it is time for the core data analysis. This second stage is concerned with the identification of patterns in the data. In SER, these patterns are referred to the effect of school and context related variables on student achievement.

Over more than three decades of investigation, the analytic techniques used by traditional SER have evolved from bivariate correlations and multiple regression analyses in the classic large-scale studies of schooling effects (e.g. James S. Coleman, 1966; Jencks, et al., 1972; Rutter, Maughan, Mortimore, & Ouston, 1979) to the multilevel modelling strategies developed in the mid 80's (e.g. Aitkin & Longfort, 1986; Goldstein, 1987).

The common outcomes of these types of analyses are lists of school and context factors (sometimes arranged in school effectiveness models) that, according to the analyses are found to have an effect on student attainment. In ATOM's terms, this kind of association constitutes the identification of patterns in data.

3.2.3 Close replication

Now, once empirical regularities have been suggested by the core analysis, the next stage is about checking the stability of these emergent data patterns. In other words, this stage is about to determine to what extent the data patterns hold across different samples / sub-samples and methods of analysis. The central objective is then to confirm the existence of the patterns detected in the previous stage. To do this confirmatory data analysis, procedures such as statistical re-sampling methods are applied. In doing so, researchers set themselves free from the assumptions of orthodox statistical theory, and make it possible to gauge the reliability of chosen statistics by making thousands, sometimes millions, of calculations on many data points (Haig, 2005a).

In Mexico, the 28 issues of the series *Cuadernos Técnicos* published by the INEE[4] and the book coordinated by Felipe Tirado (2004) are good examples of this kind of practice.

[4] Available from www.inee.edu.mx

3.2.4 Constructive replication

After confirming the existence of empirical patterns, the third stage has the objective of ascertaining the generalisability of the results identified by successful close replication. That is, to demonstrate the extent to which results hold across different methods, treatments, occasions, etc. (Haig, 2005a).

In the SER's context, it can be said that a way to confirm the generalisability of patterns could be through the use of different data sets. In other words, when studies using different analysis methods, samples, approaches and datasets get to the same or similar conclusions regarding the school achievement and its associated factors, it can be said that the generalisation of the detected patterns is confirmed.

In Mexico, for example, there are different data sets with information about educational performance and its associated factors. Some examples of these datasets are:

Institution	Data Set	Education Level
INEE - The National Institute for the Evaluation of Education	EXCALE – Quality and Educational Achievement Exams	Primary Education Lower Secondary Education
OCDE - Organisation for Economic Co-operation and Development	PISA – Programme for International Student Assessment	15 year old students
CENEVAL – National Centre for the Evaluation of Higher Education	EXANI I – National Exam of Admission to Upper Secondary Education	At the end of Lower Secondary Education
	EXANI II – National Exam of Admission to Higher Education	At the end of Upper Secondary Education
	EXANI III – National Exam of Admission to Postgraduate Education	At the end of Higher Education
UNESCO / LLECE - Latin American Laboratory for the Assessment of Education	International Comparative Study of Language, Mathematics and Associated Factors	Primary Education

Following the Mexican example, there are many studies using one or more of these datasets, (e.g. Backhoff Escudero, Bouzas Riaño, Hernández Padilla, & García Pacheco, 2007; Tabaré Fernández & Blanco, 2004; Treviño, 2006; Zorrilla & Romo, 2004). In this case, if all the studies that have explored, for example, the relation between school achievement and students' families SES have reported that there is a positive correlation between these two factors, it can be said that the this particular data pattern is generalisable.

In the development of ATOM Haig argues that the procedure just described is not the only way in which phenomena detection or data pattern confirmation can be achieved (Haig, 2005a). Other strategies have been used, especially meta-analysis. But this is controversial and represents a change in Haig's (1991) view that studies cannot be 'lumped' together in the way described by Gage, (1996) because the their theoretical elements are fundamentally incommensurable,

One of the main reasons for incommensurability of the studies considered in a meta-analysis is the Poperian thesis of 'theory impregnation', which entails that the acceptance of any singular statement is based on a prior acceptance of a body of theories or background knowledge (Popper, 1963). In this fashion, all research enquiries are theory impregnated, and it is not always the case that the different theories are commensurable. This is an argument that Lakatos accepts and is now generally accepted; therefore I shall not consider the possibility of meta-analysis.

As regards SER, even the theoretical assumptions presupposed by the enquiry are minimal, they are nevertheless there. Besides, as it has been said before, precisely because there is little theory supporting these assumptions (e.g. just the operationalisation of questionnaires as in the case of variables like school climate or head-teacher's leadership), it is difficult to see how there can be a purchase in explanatory theoretical terms on this kind of constructed variables. In other words, it is not only matter to measure

the size of their impact on school effectiveness, but to establish if they really exist or if they stand proxy for other processes and, if they exist, how are they to be theorised.

Moving to another common example, the impact of SES over student performance it is a more or less well established data pattern across SER literature. Some examples of meta-analyses[5] drawing conclusions in this sense are Wang et al. (1993), Scheerens & Bosker (1997), Teddlie et al. (2000) and Murillo et al.(2007). According to Haig (2005a), the coincident results of these meta-analysis would be enough evidence to claim that the correlation found between SES and student performance is, indeed, a phenomenon. Nevertheless, it is obvious that, by no means all the studies considered in all these works could have used the same scales to measure neither the SES[6] nor the student performance. So, although relatively empty of theoretical assumptions –but certainly not completely– their commensurability is a bit less than probable as the way suggested by the notion of phenomena.

Now, the logical suggestion to solve the problem of incommensurability in meta-analysis would be to consider only studies which share the same theoretical assumptions. In this fashion, only the studies developed using the same datasets –PISA, for example– would provide enough raw materials for detecting phenomena through meta-analysis. Nevertheless, as is well-known, one of the major criticisms levelled at PISA or at any other multinational initiatives is –once again– that they do not take account of the context (see for example Dohn, 2007). This suggests that in social sciences, or at least in

[5] In the first work Wang and her colleagues estimate the influence of educational, psychological, and social factors on learning by using evidence accumulated from 61 research experts, 91 meta-analyses, and 179 handbook chapters and narrative reviews. Scheerens and Bosker analyse 89 SER works to establish the scientific properties of school effects. Teddlie and his colleagues make an effort to systematize the research findings about the magnitude of school effects of what they consider the 26 most important SER works. Finally, Murillo and the IIEE's (The School Effectiveness Iberoamerican Research) team make a summary of the school effectiveness factors that have been found by, again, what they consider to be the most important works in the region.

[6] The example of the SES scales results more illustrative in this sense. In the cited studies SES is measured using a very wide range of indicators: from the simple 'schools meals' dummy variable to an index developed with base of the notion of Bourdieu's global capital.

SER, it is more adequate to look for contextually based robust data patterns rather than phenomena.

As a result, the type of theories that SER should look to develop are not universal, but contextual theories. That is, their explanatory power will be only valid for the context from which the data patterns were extracted. It has to be in that way because much of an education system's features are hidden from our view; so, if we want to know how it works rather than only settling for an account of what happens at the surface, then we have to seek for deep-structural contextual theories (Haig, 1991).

Finally, it is important to say that even when meta-analysis can with difficultly be considered an appropriate method for phenomena detection, it can be regarded as a legitimate and relevant means for detecting robust data patterns, which when obtained taking account of the context can provide the building blocks needed for developing a realist theory of school effectiveness.

3.3 Theory construction.

The detection of empirical phenomena and /or the confirmation of contextually based robust data patterns are in themselves major aims of scientific research, and represent a key type of scientific discovery. Some evidence has been provided to suggest that SER has made very important progress towards the later. Nowadays it can be said that some consensus has been reached among SE researchers about what are the factors related to school effectiveness. Nevertheless, as it has been said before, one of the main critiques of SER is its lack of a theory to explain how these factors are related to student attainment, how these relationships works. As Murillo recognizes "… it can be said that we are beginning to know some things about what works in education, but the ignorance about why it works is still very important" (F.J. Murillo, et al., 2007: 86).

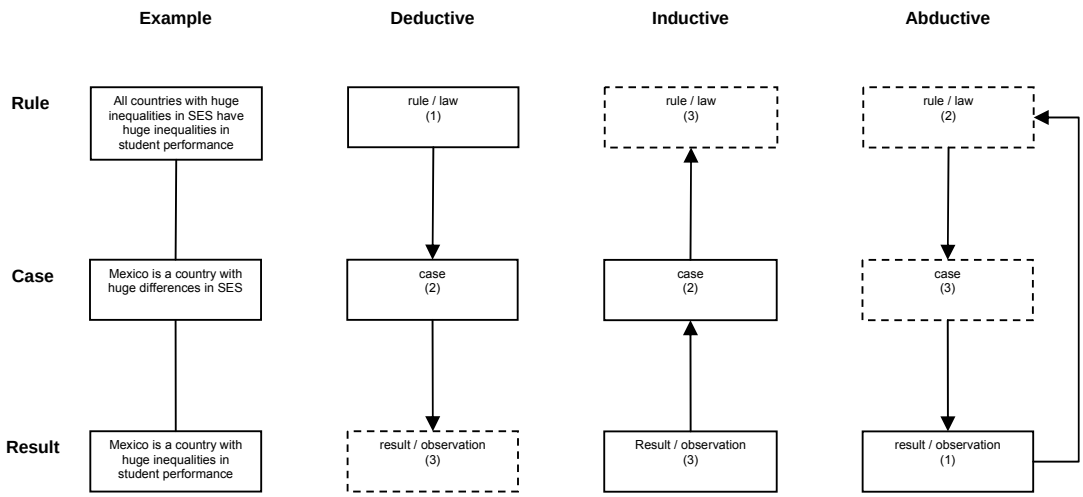
The second phase of ATOM refers precisely to theory construction. For it, theory construction comprises three stages: theory generation, theory development and theory appraisal. Although these stages do not follow a strict temporal order, theory development has to be preceded by theory generation. However the theory appraisal stage begins with theory generation, continues with theory development and extends to the comparative appraisal of fully-developed theories (Haig, 2005a). Further, the main characteristic of these three stages is that they all are abductive, although the form of abduction is different in each case.

3.3.1 Theory generation

Next, a general characterization of the kind of abductive reasoning that is normally used for theory generation is presented, followed by a brief description of a statistical technique that suits the requirements to be used as an abductive method of theory generation in the education field.

Abductive inference

As mentioned before, the most common types of inference used in scientific research are deduction and induction. Abduction is a not so common form of inference in scientific methodology and it is also the backbone of ATOM. The next figure shows in a graphical fashion the three forms of inference.



Boxes with continuous lines contain premises / hypothesis that are presupposed as given / true. Boxes with dotted lines contain hypothesis that are inferred.
Figure adapted from Fisher (2001).

Figure 1. Forms of inference

Conclusions reached by deductive reasoning are known to preserve the knowledge contained in their premises. They are truth-conserving; if the premises are truth, the conclusion must be truth as well (Fischer, 2001). However, the information contained in the conclusion is already implicitly contained in the premises; deductive reasoning, therefore, is not synthetic – *i.e.* does not add any new knowledge. Deductive inference, as shown by the arrows in the figure, proceeds from a general rule or law to the assertion of a particular e result.

As the arrows in the figure show, induction proceeds in the opposite direction to deduction; from a particular observation to a general law or rule. Although inductive arguments are content increasing, they are not synthetic either because, as Peirce's logical analysis shows (c.f. Peirce, Houser, Kloesel, & Peirce Edition, 1992), any form of induction to reach a rule or law is always dependent upon hypotheses which must have been constructed beforehand by cognizing subjects, this hypotheses are in fact what constitutes the actual new knowledge[7]. And this process of hypothesis construction is abductive, as

[7] Additionally, induction cannot be considered truth-conserving because their inferences are only hypothesis that cannot be proved with ultimate certainty (Fischer, 2001). Contrary to deduction, inductive inference proceeds from a particular assertion to a general rule.

far as its logical form is concerned. So, if neither induction nor deduction enlarge our knowledge of the world by themselves, then abduction is the only form of inference that can be regarded as a knowledge-generating mechanism (Fischer, 2001: 368).

The origins of the abductive inference can be traced to Aristotle (Bar, 2001), but its modern development is due the work of Charles Sanders Pierce (1937 – 1958). For Pierce, "abduction consists in studying the facts and devising a theory to explain them" (Pierce in Haig, 2005b: 305). According to Fischer (2001: 368-369), in the abductive mode of inference the first step consists of presenting a phenomenon [data pattern] or result (1) to be explained or understood; then the second step introduces an available[8] or newly constructed hypothesis or rule (2) by mean of which the case (3) is abduced.

Following Haig (op cit), the most common application of abduction is in the process of inferring hypotheses from puzzling facts to explain them. Nevertheless, Thagard (1998) has shown that there are different ways in which explanatory hypothesis can be abduced, e.g. existential and analogical abduction. In the former the existence of previously unknown objects is postulated and; in the latter, based on previously existent hypotheses, similar but new hypotheses are generated.

In the theory generation stage of ATOM the type of abduction used is existential. As will be shown later, analogical abduction is used in the theory development stage as a modelling strategy; and inference to the best explanation –a further form of abduction– is used in the theory appraisal stage.

Based on a Pierce's syllogism, Haig (2005a) characterises existential abduction as follows:

[8] It is here where SER can make use of theoretical developments from other disciplines (Sandoval-Hernandez, 2008)

The surprising phenomenon, P, is detected.

But if hypothesis H were approximately true, and the relevant auxiliary knowledge, A, was invoked, then P would follow as a matter of course.

Hence, there are grounds for judging H to be initially plausible and worthy of further pursuit.

This schematic characterisation of existential abduction has to be understood in the light of the following considerations.

- As mentioned before, in social sciences and specifically in SER, the facts to be explained are not normally phenomena (P) but contextually based robust data patterns (D), and, strictly speaking they are not detected but confirmed. Thus, Haig's schematic depiction of abductive inference should be modified as follow in order to apply it to SER.

  The surprising contextually base data pattern, *D*, is *confirmed*.

  But if hypothesis H were approximately true, and the relevant auxiliary knowledge, A, was invoked, then D would follow as a matter of course.

  Hence, there are grounds for judging H to be initially plausible and worthy of further pursuit.

- A new element is introduced in the argument: auxiliary knowledge. This is because, according to Haig (2005a) confirmatory theory in the philosophy of science makes it clear that the facts, phenomena or data patterns are derived not just from the proposed theory but form that theory and its accepted auxiliary claims taken from relevant background knowledge.

- It should be noted as well that the conclusion of the argument is not that the hypothesis is true, only that there are grounds for thinking that the proposed hypothesis may be true, and thus, worthy of further pursuit. So, abductive inferences are of the kind of hypotheses that are logically invalid and must, therefore, be corroborated within conceptual systems and theoretical frameworks.

- Finally, the scheme above focuses on its logical form and does not tell much about the theory construction process. Nevertheless, Haig (op cit) explains a set of regulative constraints that enable ATOM to use existential abduction inference not only to achieve any conceivable explanation, but plausible explanations. This host of rules, heuristics and principles that govern what counts as good explanations, are contained in the next sections of this work, i.e. theory generation, theory development and theory appraisal.

Statistical techniques for theory generation

There are not many codified abductive methods ready to use in theory generation processes, however Haig (2005a) claims that Explanatory Factor Analysis (EFA) is a notable exception. Although Haig talks specifically about EFA, this technique is part of a family of methods that includes Confirmatory Factor Analysis and Structural Equation Models (cf.Child, 2006). The key characteristic of all those techniques that makes it possible to consider them as abductive methods is that they facilitate the postulation of latent variables that are thought to underlie patterns of correlations in new domains of manifest variables (Haig op cit: 377). To do this, these techniques use multiple regressions and partial correlations to produce models of sets of observed variables in terms of linear functions of other sets of unobserved variables.

As mentioned above, existential abductions consist in postulating the existence of entities previously unknown, i.e. theoretical entities, in order to

explain data patterns or phenomena. Following Haig (op cit), similarly EFA postulates the existence of latent variables in the form of Spearman's g, for example.

The use of existential abduction used in EFA to infer the existence of a theoretical entity, in this case Spearman's g, can be exemplified using the schema for abductive inference presented before.

> The surprising data pattern expressed in the positive relation between SES and student performance in primary education in Mexico (P) is *confirmed*.
>
> If this correlation can be explained by the concept of cultural capital related with SES (g), and g can be validly and reliably measure by an objective instrument, then P would follow as a matter of course.
>
> Hence, there are grounds for judging g to be initially plausible and worthy of further pursuit.

Now again, it is important to remember that ATOM was originally designed to be applied in behavioural sciences, and for that reason some modifications are necessary to adapt it to be used within SER. In this case EFA is not the technique that better suits educational data, in its place Multilevel Structural Equation Modelling (MSEM) is proposed.

In factor analysis models all latent variables and indicators vary between units (typically subjects) and are assumed to be independent across units. This assumption is violated in multilevel settings, such as educational data where units (e.g. students) are nested into clusters (e.g. schools) and thus have within-cluster dependence (Rabe-Hesketh, Skrondal, & Zheng, 2006).

There are different approaches to extending factor analysis or structural equation models for multilevel settings. One of the most common is to

formulate separately within-cluster and between-cluster models. Nevertheless, formulating the models separately does not allow cross-level paths from latent or observed variables at a higher level to latent or observed variables at a lower level, and does not allow for indicators varying at higher levels (Rabe-Hesketh, et al., 2006). Another approach is to use multilevel regression to formulate the models since it allows working in settings where some of the response variables and some of the explanatory variables at the different levels are latent and measured by multiple indicators (idem).

So far, some arguments have been given to make the point that MSEM can be used as a tool to abductively infer theoretical entities within ATOM, and that this technique suits the structure of educational data. Nevertheless there is another point that is very important to draw attention to. To use MSEM in this sense, it is necessary that the researcher interprets the statistical factors. The researcher has to make use of his/her own abductive powers when reasoning from correlational data patterns to underlying common causes (Haig, 2005a). In other words, as the explanatory hypotheses are given in the second premise of the schema for abductive inference, an account of the genesis of this explanatory hypothesis has to be provided by other means. Regarding this point, Haig suggests that “reasoning to explanatory hypothesis trades on human being’s evolved cognitive ability to abductively generate such hypothesis” (op cit: 378).

MSEM, then, can be seen as a sub-method of ATOM for theory generation, Even though it clearly exemplifies the character of existential abduction, MSEM does not have to be expected to produce highly developed theories ready to be validated. At this stage of theory generation what we are dealing with is rudimentary theories that have initial plausibility. Theories of this kind postulate the existence of hidden causal mechanisms, but they do not offer a characterisation of their nature (Haig, 2005a). To move ahead of the rudimentary nature of these theories it is necessary to engage in theory development.

3.3.2 Theory development

The hypothetic-deductive view of scientific method, which is the most common one, does not give enough importance to theory development. In general terms, it assumes that hypothesis and theories emerge fully developed and ready to be tested. On the contrary, ATOM dedicates this stage to the development of explanatory theories.

As was said before, the theories generated in the last stage are rudimentary and dispositional in nature, because for them to be fully developed and thus ready to be evaluated against their rival theories, explicit provision has to be made to build on them.

To do that, ATOM proposes to construct analogical models of the causal mechanisms implicated. Analogical models show the relevant relation between the model and the reality being represented (Haig, 2005a). This strategy increases the content of explanatory theories, and to do it makes use of analogical abduction.

As was mentioned before, techniques such as EFA or MSEM can postulate the existence of theoretical entities, but they do not say anything about their nature; analogical modelling is a way to make progress in this sense. Analogical modelling is also useful to asses the plausibility of the expanded understanding of the theoretical entities postulated during the theory generation.

Following Haig (op cit), as the theories generated by ATOM are explanatory theories, the analogical models involved in their development make use of analogical reasoning. Analogical abduction can be schematised as follows:

> Hypothesis H* about property Q was correct in situation S1.
>
> Situation S1 is like situation S2 in relevant respects.
>
> Therefore, an analogue of H* might be appropriate in situation S2.

An example of analogical abduction in the education context could be as follows:

> The hypothesis of cultural capital was correct in explaining the differences in educational achievement in the French education system.
>
> The French education system is like the Mexican education system in relevant respects.
>
> Therefore, by analogy with the French education system, the hypothesis of cultural capital, or an analogous one, might explain the differences in education achievement in the Mexican education system.

Of course this is just an example with no serious intention of comparing the education systems of the two countries. For constructing plausible analogical models which add to the explanatory power of the postulated theoretical entities, it would be necessary to evaluate the aptness of the analogical model, that is, the likeness in relevant aspects between the source (French education system) and the subject (Mexican education system) of the analogy (Harre, 1976).

Up to now, it has been said that, for ATOM, the epistemic worth of the theories generated by existential abduction are only evaluated concerning

their initial plausibility, and thus they are rudimentary and dispositional in nature. It has been also said that after their generation, these theories are to be evaluated by judging the appropriateness of the analogies that function as source models for their development. The last stage regards the appraisal of these, now, well-developed theories according to a number of additional criteria to judge about the best competing explanatory theories.

3.3.3 Theory appraisal

There are several approaches to the evaluation of scientific theories, among them the hypothetic-deductive method stands out for being the most common. Nevertheless, faithful to its name, ATOM uses an abductive account of theory evaluation, i.e. inference to the best explanation.

This account of theory evaluation assesses empirical adequacy in terms of explanatory breadth, and not predictive success as the hypothetic-deductive account does. The reason for using inference to the best explanation when evaluating explanatory theories is that this is the only method available to explicitly weigh up such theories in terms of the scientific goal of explanatory worth (Haig, 2005a: 380).

Inference to the best explanation is then a method of reasoning in which the hypothesis that would, if true, best explain the relevant facts (phenomena or data patterns) is chosen. This kind of reasoning starts from a set of accepted phenomena or data patterns and infers their most likely, or best, explanations based on certain criteria.

According to Haig (2005a), the most developed formulation of inference to the best explanations is the one provided by Thagar (1992). This formulation proposes to use a number of evaluative criteria that has been proved to produce reliable judgements of best explanation in science (Haig, 2005a). Thagard's approach is called Theory of Explanatory Coherence (TEC). For

TEC, to infer that a theory is the best possible explanation, it has to be judged as more explanatorily coherent than its rivals. The criteria to determine the weight of the explanatory coherence of a theory are: consilience, simplicity and analogy.

The criterion of consilience, or explanatory breadth, is regarded as the most important for choosing the best explanation. It holds the idea that a theory is more explanatorily coherent if it can explain a greater range of facts.

The idea of simplicity is that predilection has to be given to theories that make the less special or ad-hoc assumptions. According to Thagard (1988), simplicity has not to be sacrificed in order to enhance consilience.

Finally, the importance of analogy resides in the fact that, as it was discussed before, it can improve the explanation provided by a theory. An explanation will be judged as more coherent if it is supported by an analogy to theories that have already been successfully tested.

Up to now, there are no fully developed theories within SER to be evaluated regarding their explanatory coherence. What we have, at best, is a set of rudimentary theories that need to be developed in order to be ready for a full appraisal of their explanatory power. So, to reach this point, fully developed explanatory theories have yet to be provided.

3.4 Conclusion.

As it has been said before, the main criticism of SER concerns its lack of theory in both, the selection, operationalisation and explanation of the relationships between the variables it uses; and for supporting its fundamental assumptions regarding the nature of schools, students and teachers (Sandoval-Hernández, 2008).

It has been also suggested that a critical realist approach would provide the elements to frame a methodology for the construction of the theories needed by SER (idem). Furthermore, ATOM's relevance for this matter has been also pointed out by showing that it shares the ontological and epistemological commitments of the critical realist paradigm.

This is how, within SER, ATOM aspires to be a coherent theory of scientific method that brings together a series of strategies and sub-methods to: i) confirm the existence of contextually based robust data patterns and ii) to provide a systematic guide-line to develop the theories to explain them. The phase of data patterns confirmation is just a systematization of a procedure that is very common in research practice. As has been already showed; there is enough evidence to say that, at least in the so-called developed countries, this first phase has been already met within SER. Nevertheless the same cannot be said for the Mexican case; moreover, there are no methodological writings that present this entire process as a whole, neither in the developed countries nor in Mexico.

In the same way, the phase of theory construction is a reconstruction of different practices used by science to obtain or increase knowledge. However, once again, the abductive generation of elementary plausible theories, the strategy of analogical modelling for theory development and the theory appraisal by the method of inference to the best explanation are rarely presented as a coordinated whole. ATOM's main virtue consists in coherently combine these methodological resources in a broad theory of scientific method, which main objective is to produce sound explanatory theories.

But, what is theory for? How can theory help SER?

In Mahon's words, "…theory can separate us from the contingency that has made us what we are, the possibility of no longer seeing, doing or thinking what we are, do or think" (Mahon, 1992: 122). Drawing on this line, Ball defines theory as a "vehicle for 'thinking otherwise': as a platform for 'outrageous hypotheses' and 'unleashing criticism'" (Ball, 1998a: 79). From

my point of view, theory offers a language for challenging those ideas articulated for us by dominant others and for proposing and supporting alternative ones.

That is how theory can shed light on possible ways to break with the current dynamic of reproduction of inequalities, which is one of the main characteristics of Mexican education (Sandoval-Hernández, 2005) and one of the main objectives of SER in the Latin American region (F. J. Murillo, 2004).

The goal of such theory is to de-familiarise present practices and categories to make them less necessary and less self-evident and, as a consequence, to open up spaces to the development of new ways to conceptualise and understand the problems SER works with.

However, the point of producing theory is not only to be critical. In order to go beyond the criticism and actually propose alternatives, it is necessary to start from another position and begin from what is normally excluded (Ball, 1998a).

This is the kind of theories, I suggest, SER needs: theories that provide the elements to reveal and undermine what is most invisible and insidious in our education systems; theories that support the construction of alternative SER programmes especially designed to deeply understand the particular characteristics of the education systems according to the context in which they are embedded; a contextual theoretically informed account of SER.

4. Data Analysis. Preliminary information.

In order to explore to what extent the methodology developed in the last chapter can be applied to school effectiveness research it is necessary to apply it in a particular context. The following three chapters are concerned with the application of ATOM to the analysis of the inequity patterns of lower-secondary education in Mexico.

According to the research and analytical questions and to the methodology proposed in the last chapter, the analysis of the data will be divided into two main stages and several phases. But before getting into the data analysis, this chapter will provide a description of the datasets used in this work and a theoretical justification for the inclusion of the variables involved in the analysis. Then, chapter five will be concern with the Establishment of Contextually-Based Robust Data Patterns, and chapter six with the Theory Construction stage.

The following table shows then the structure to be followed in the next three chapters.

Table 1. Structure of the Data Analysis.

Preliminary Information		Description of the datasets						
		Theoretical justification of the variables involved in the analysis						
Data Analysis	**Stages**	Establishment of Contextually-Based Robust Data Patterns				Theory Construction		
	Phases	Initial Exploratory Data Analysis	Core Data Analysis	Close Replication	Constructive Replication	Theory Generation	Theory Development	Theory Appraisal

4.1 The datasets

The datasets used for this work have been built around two tests (one for language and one for mathematics) applied to a representative sample of the

students who were finishing the lower secondary education in Mexico in 2005: the Quality and Achievement Examinations (EXCALE by its acronym in Spanish). Both datasets include achievement outcomes and information about the context in which the students are embedded.

The EXCALE tests were developed and applied by the National Institute for the Evaluation of Education (INEE by its acronym in Spanish). The INEE is an autonomous institution in charge of the national achievement assessments for basic education in Mexico (elementary and lower-secondary education).

According to the INNE, the main characteristics of these tests are (González & Bosco, 2006: 34):

i) EXCALE are criteria type examinations. That is, the tests were designed to measure the competence that individuals achieve in a specific subject aligned with the national curriculum, and thus their results are not interpreted regarding the population's mean. Instead, the reference to interpret this kind of tests is to what extent students have a good command of the topics evaluated (Popham, 1990).

ii) The EXCALE tests follow a matrix design. Students only answer a sample and not all the questions included in the bank of items. This design allows a wider range of contents to be covered, ensuring aggregated validity without making the test too long for each student.

iii) The tests scores are presented in a scale from 200 to 800 units, with a mean centred in 500 points and a standard deviation of 100 units (Backhoff, Andrade, et al., 2006). This scale was constructed using the Theory of Item Response with the Rasch Model (Cf. Rasch, 1960).

iv) Along with the educational attainment tests, a set of context questionnaires were applied to students, teachers and head-teachers. These questionnaires contain information about the factors associated with the student's performance in the tests according to the INEE's Conceptual Model of Educational Achievement (see

Annex A). A full list of the items included in each instrument can also be found in the Annex B.

4.2 The sample

The educational attainment tests were applied to a sample of the students who were finishing the lower secondary education in Mexico in 2005. The sample is representative to national, state and strata (type of education) levels. The types of education represented are General, Technical, *Telesecundaria* and Private[9]. The sample is formed by 52,251 students in 2,397 schools which represents 2.9% of the total population of students finishing the lower secondary education in 2005 in the Mexican Education System (C.f. Backhoff, Andrade, et al., 2006). The next table shows the number of students and schools considered in the sample for each type of education.

Table 2. Number of students and schools in the sample by type of education.

Type of Education	Schools		Students	
	N	%	N	%
General	566	23.6	16,600	31.8
Technical	544	22.7	16,093	30.8
Telesecundaria	751	31.3	9,720	18.6
Private	536	22.4	9,838	18.8
Total	**2,397**	**100**	**52,251**	**100**

Source: (Backhoff, Andrade, et al., 2006)

Like the educational assessment tests, the context questionnaires were applied to representative samples of students (n=52,251), and also teachers (n=6,159) and head-teachers (n=2,287). The information provided by these questionnaires is also representative to a national, state and strata levels.

[9] See the Annex D for a full description of these types of education.

4.3 The dependent variables

The dependent variables are the scores obtained by the students in the Language and Mathematics tests. The Language test evaluates three dimensions with a total of 108 items: reading comprehension, reflections on language (i.e. grammar, semantics, and syntax) and writing expression. The Mathematics test evaluates five dimensions with 128 items: arithmetic, algebra, geometry, management of information and probability. Most of the items included in the tests are multiple choice questions, with four options; where only one is correct, no partially correct answers were included. The writing expression dimension was evaluated with open ended questions, where the student wrote a small text that was then evaluated by a group of trained specialists[10].

By using the Item Response Theory, specifically the Rasch Model (Rasch, 1960), scales were constructed for the Language and Mathematics scores. Both scales have a theoretical mean of 500 points and a standard deviation of 100.

4.2 The independent variables involved and their theoretical underpinnings

In this section different approaches that will work as theoretical underpinnings for the relationships between the independent and dependent variables will be presented. One way to organise them is according to the level of analysis in which this approaches can be applied, i.e. students and schools. Within these levels, the variables involved in the analysis are organised in conceptually related theoretical groups.

[10] Because the results for the writing expression dimension were treated in a different way and only had a national representation, they are contained in a different dataset and reported in a different document (Backhoff Escudero, Peon, Andrade, & Gonzalez, 2006), therefore are not considered in this work.

4.2.1 Student level variables

At the individual or students level the variables are grouped into the following blocks: demographic variables, family economic and cultural variables and family structure. The next table shows the variables included in the first group.

Table 3. Demographic variables at the student level

Variable name	Description	Values	Measure
Gender	Gender	1=female, 0=male	Nominal
extra_age	If students are older than the normative age	1=extra age, 0=otherwise	Nominal
indigenous_language	Index constructed to measure the use of an indigenous language[11]	Standardized variable with mean=0 and std deviation=1	Scale

The gender differences in student attainment have been largely documented and traditionally linked to issues of gender inequalities in education. The results of a large body of research show that females generally achieve higher scores than males in language tests while males do better in mathematics tests. However, some recent evidence has been produced claiming that these differences are more related with students' academic self-concept (F.J. Murillo, et al., 2007; OECD / UNESCO, 2003), motivation towards specific subjects (F.J. Murillo, et al., 2007; OECD / UNESCO, 2003) and learning styles (OECD / UNESCO, 2003). The results of these works suggest that the observed differences are explained by: i) a gender difference in the motivation towards language and mathematics related subjects (i.e. females report higher motivation for language related subjects and males for mathematics), ii) a gender difference in the academic self-concept related with each subject, and ii) gender differences in preferred learning-styles, females preferring memorisation strategies (more useful in language) and males elaboration strategies (more effective in mathematics).

The normative age for the children studying the third grade of lower secondary education in Mexico is 15 years old. The variable reporting if the students are over this normative age is used as a proxy to measure the educational lag, i.e. if the student has been out of the education system for one or more years. As it is

[11] The procedure followed for constructing the indices is explained further in this chapter.

show by several works (e.g. Carlos Muñoz-Izquierdo, et al., 2004), a consistent association of this variable with low academic performance can also be found in the literature.

In Latin America, since the beginning of the 80s, there has been special concern about the ethnic inequalities in education. Accordingly, several studies have been carried out all with similar conclusions: belonging to an indigenous group is also associated to low academic performance. On the one hand this is explained because of the precarious economic conditions of these groups, and in the other because of cultural factors (i.e. not receiving education in their own language and lack of relevance / inadequacy of the curriculum to their reality) (F. J. Murillo, 2003).

The second theoretical block is formed by the variables measuring the economic and cultural characteristics of the student's families. The next table shows the variables included in this block.

Table 4. Family economic and cultural variables at the student level

Variable name	Description	Values	Measure
socioeconomic_capital	Index constructed to measure the family's cultural and economic capital. For the cultural capital contains variables like participation in cultural activities, parents' level of education and number of books at home. For the economic capital contains variables reporting the presence of goods and services in the students' household.	Standardized variable with mean=0 and std deviation=1	Scale
Oportunidades	Oportunidades scholarship holder	1=yes, 0=no	Nominal
work_out_home	Index constructed to measure the time spent by students working out of home	Standardized variable with mean=0 and std deviation=1	Scale
s_educational_aspirations	Up to what level students want to study	1=lower-secondary, 2=secondary, 3=vocational education, 4=university, 5=postgraduate education	Ordinal

Reading	Amount of time spent reading during the last week	0=none, 1=less than 1 hour, 2=between 2 and 3 hours, 3=between 3 and 4 hours, 4=between 4 and 5 hours, 5=more than 5 hours	Ordinal
Homework	Index constructed to measure the amount of time spent studying and doing school homework at home	Standardized variable with mean=0 and std deviation=1	Scale

There is a consensus in the literature about the significance of the relationship between these variables and the students' educational attainment. Even though it is acknowledged the so-called reproduction theories have strong links with specific geographical and historical contexts, I consider the concepts provided by the theories developed by Bourdieu and Passeron (1977) and Bernstein (1975) a useful framework to analyse the relationship between cultural and economic characteristics of the students' families and their educational attainment in the Mexican lower-secondary education. However, the limitations of these theories for their application in the context of this work will be analysed in the concluding chapter.

Drawing on Bourdieu and Passeron's (1977) ideas, it can be said, at risk of oversimplification, that the educational performance of a student depends on the amount and composition of his/her capital and on the extent to which this combination satisfies the symbolic requisites of the dominant culture legitimated by the education system. Therefore, from Bourdieu's perspective the schools play an active role in the reproduction of social inequalities.

From the vast theory developed by Bourdieu and Passeron, the types of capital are then concepts particularly useful to frame some of the variables involved in the analysis developed by this work.

Bourdieu defines capital as "…accumulated labour (in its materialised form or its 'incorporated', embodied form) which, when appropriated on a private, i.e., exclusive basis by agents or groups of agents, enables them to appropriate social energy in the form of reified or living labour" (Bourdieu, 1983: 241). From this definition, in his work entitled Forms of Capital (1983), Bourdieu

distinguishes several types of capital among which the economic and cultural capitals are especially relevant for this work.

Economic capital can be defined as the command students have over economic resources. Even when the author does not specify what can be considered as resources, it is common to find in the literature that this concept is commonly understood as exchange values, like income and assets that can be easily transformed into cash. In this sense, variables referring to the possession of consumer goods in the household are used as a proxy measurement of a family's economic capital. Furthermore, it is assumed that the greater the economic capital in a family the better the physical conditions supporting the cognitive development of its family members, and therefore the higher their educational attainment.

The command over economic resources could also be manifested in the physical appearance and in the social presentation of the students (e.g. healthiness, tidiness, kind of clothes worn), and both aspects could represent signals indicating the educational possibilities of each student. In this fashion, teachers and peers would assign higher educational expectations to those students with a physical appearance and a social presentation matching those of the legitimised middle-class (Cf. Elmore, 1978). In turn, these higher expectations would influence positively the educational attainment.

As regards cultural capital, it can be accounted by the cultural long-lasting dispositions embedded in the human mind and body, as well as in cultural goods and educational credentials. Following Bourdieu (1983), cultural capital can appear in three states: objectified, institutionalised and embodied. In its objectified state, cultural capital consists of cultural objects, such as pictures, books, didactic materials, instruments and machines such as a PC, or even the access to internet. In its institutionalised state, cultural capital consists of educational credentials such as academic degrees held by the family members. Finally, in its embodied form, cultural capital consists of permanent dispositions in the individual person; it is both the acquired and inherited properties of a person mainly from the family through socialisation.

Accumulation of embodied cultural capital can be manifested in different ways. Examples of this can be i) the access to cultural practices legitimated by the dominant culture (e.g. theatre, museum exhibitions, music concerts, etc.), ii) the production of legitimate signals (e.g. an specific linguistic code), iii) a high value assigned to education and the consequent subjective dispositions towards it (e.g. the amount of time students spend reading for pleasure or their academic aspirations).

Because of their complexity, it is convenient to go deeper into the last two examples. For the second one I will use some of the concepts developed by Basil Bernstein (1971) in his early work on communication codes and schooling. According to this author, the family's position in the labour division has a central role in the production of differentiated linguistic codes. Bernstein distinguished between a restricted code belonging to the working class and an elaborated code belonging to the middle-class. That is, working class parents would typically have manual jobs in which low verbal elaboration is required; therefore they would develop restricted codes (i.e. context dependent and particularistic). Furthermore, working class families would tend to concentrate in class-homogeneous geographical areas, where they would be only in contact with other individuals with similar characteristics and life experiences, thus there would be a great deal of shared and taken-for-granted knowledge among them. Along these lines Atherton (2008) suggests that restricted codes draw heavily on background knowledge and shared understanding, creating or reinforcing a feeling of belonging to a certain group or class.

Conversely, middle class parents would have jobs in which they constantly use oral and written communication, developing as a result elaborated codes (i.e. context independent and universalistic). Following Atherton (op cit), middle-class families are more geographically, socially and culturally mobile so they are in contact with individuals from a wider range of social groups and therefore do not have shared meanings and/or a common taken-for-granted knowledge base to draw on. As a result they need an elaborated linguistic code that spells everything out so that everyone can understand it.

In this order of ideas, because schools "…are concerned with the introduction of new knowledge which goes beyond existing shared meanings" (Atherton, 2008), students who can handle an elaborated code (i.e. middle-class students) are more susceptible of performing better in the education system.

Elaborated and restricted codes lay down different conditions for the educational performance of students (Bernstein, 1971). For students who only have restrictive codes at their disposal (i.e. students from disadvantaged contexts) it would be more difficult to interpret and produce the symbols legitimised in an education system thought for and by the dominant middle class (Blanco, 2007: 119).

Now, regarding the value students assign to education and the consequent subjective dispositions towards it, some concepts developed within rational action theory (RAT) will be useful in framing them. At this point, in order to keep coherence within the theoretical framework, it is necessary to make a link between the reproduction and the rational-choice theories.

For doing so, I will draw on some basic concepts of architecture of theories. According to Lauder (2007), at root theories have at least three basic building blocks: i) a view of human nature, ii) a way of articulating the relationship of that nature to society, and iii) a way to relate the first two points to social change. These building blocks can be seen as the metaphysics underlying the more testable parts of a theory, and they let us know the theories' assumptions regarding the degree of social determinism or freedom individuals may have.

It may be thought that in order to keep coherence within a theoretical framework it is necessary that all the theories forming it share or have similar assumptions regarding the degree of social determinism. On those grounds theories like those of Rational Action and Reproduction could not be part of the same theoretical framework. For example, some of the main critiques to Bourdieu's theory dismiss it as heavily deterministic; in that sense the RAT can be seen as the exact opposite. However, as it is shown bellow, the indeterminacy of some

of Bourdieu's concepts[12] opens some paths to establish links between both theories.

According to Hedström and Swedberg, "[t]he common denominator of rational-choice sociologists is that they use explanatory models in which actors are assumed to act rationally, in a wide sense of that term" (Hedström & Swedberg, 2008: 872). One of the key authors within this tradition is Boudon (1974), who developed the concepts of the rational-choice theory in the educational and social inequality field. Even though Boudon, bases the explanation of this social phenomena on realistic theories of action, he also recognises the importance of considering the different limitations of the actors. In other words, individuals may act in a rational way in the sense that they have a reason for doing what they do, even if their actions do not necessarily lead them to the most optimal results (Hedström & Swedberg, 2008).

In this sense it is important to remember that, in Bourdieu's theory, social actors are not completely passive, they do have agency, yet a limited one. Bourdieu sees dispositions (e.g. towards education) as the products of opportunities and constraints framing people's earlier life experiences (Reay, 2004). In Bourdieu's own words, these dispositions are "…inculcated by the impossibilities, freedoms and necessities, opportunities and prohibitions inscribed in the objective conditions" (Bourdieu, 1990b: 54). As a result, there would be an inclination to exaggerate the objective difficulties they come across, and even to reject the sole possibility of what is considered as improbable. For example, based on that argument, working-class families would tend to over-react to the objective difficulties they would need to face in order for their members to reach university education, therefore to reject the possibility as unthinkable, and thus to collude in their own disadvantage when failing to take advantage of the limited (but existent) opportunities available to them (Barone, 2006).

Nevertheless, and it is here where the rational-choice theory comes into play, there is a considerable amount of empirical research that provides contradictory evidence, at least partially (see for example Barone, 2006; Becker, 2003; Breen

[12] Although Bourdieu himself sees this as a positive attribute and describes his concepts as *open concepts designed to guide empirical work* (Bourdieu, 1990a: 107 in Reay, 2004)

& Goldthorpe, 1997; Need & de Jong, 2001). That is, that under certain conditions, some members from disadvantaged backgrounds would be able to make rational decisions that allow them to adapt and to take advantage of these limited opportunities available for them within the social structure in order to achieve their objectives.

For example, assuming a scenario with at least the minimal structural conditions for someone from a disadvantaged background to go to University (e.g. the existence of a public free University in the community); it would still be necessary that the person made the decision to do it. Among the conditions necessary for this to happen, authors like Garcia-Castro and Bartolucci (2007) consider two as specially important: the perception of pertinence and the perception of feasibility. That is, the perception that it is convenient and possible according to the specific life conditions of an individual. For this research it is assumed that the presence of high educational aspirations and positive dispositions towards learning would increase embodied cultural capital of a subject.

Then, the key to integrating these two different approaches concerns the limits and possibilities that class structures or constraints impose on decision-making. For example, as explained above, Bourdieu has been interpreted as imposing a strong structuralist interpretation by Goldthorpe and others. In this interpretation, Bourdieu's notion of habitus, which is a form of ingrained class socialisation, determines that working class students will not attend for example higher education. However, more recently Reay (2004), has argued for a more flexible account of habitus that accords with the point made by Goldthorpe that some students from poor or working class backgrounds do attend university.

Similarly from a rational choice perspective there are always trade-offs for working class students between the risk of going to university and remaining within a familiar context. In both theoretical traditions it can now be argued that the limits and possibilities of choice for working class students is a matter of empirical analysis.

Following the arguments explained above, it is assumed that a greater amount of cultural capital in its three forms (i.e. objectivised, institutionalised and embodied) would be positively related to a better educational performance.

Now, regarding the specific variables included in this group, I shall start by saying that because the concepts of economic and cultural capital are normally considered as two concepts analytically independent in theoretical terms, the first approach taken for their operationalisation was to construct an index for each of them. However, as it was mentioned before, the economic capital is not operationalised with a measure of income, but with a proxy measure of consumption of goods; in that sense cultural and economic capital merge since the kind of goods consumed by the students and their families are also a symbol of their class status.

This argument was further tested on empirical grounds by exploring the structure of the variables involved. The results of testing for internal adjustment and internal consistency among the items composing the economic and cultural capitals showed that it was convenient to merge the variables in a single index. This variable was denominated "socioeconomic_capital". In this way the socioeconomic capital includes a set of items measuring the presence and amount of consumer goods and services in the household (i.e. economic capital), a set of items measuring the participation of the student in cultural activities (i.e. embodied cultural capital), the parents' level of education (i.e. institutionalised cultural capital), the number of books at home (objectified cultural capital). In this way, a high global capital in the family is expected to be positively associated to the students' educational attainment.

Other variables that did not show internal consistency with the index described above, but that are still considered as important in theoretical terms are: Oportunidades, work_out_home, s_educational_aspirations, Reading and Homework.

The first two variables are assumed to be related to the family economic capital. The former, "Oportunidades", indicates whether the student's family receives support form a cash-transfers programme denominated with the name of the

variable. The latter, “work_out_home”, is an index constructed to measure the amount of time a student spent working out of home in a remunerated activity. Both variables are assumed to indicate low availability of economic resources in the household (economic capital), and therefore to be negatively related to the students’ attainment.

The next three variables are assumed to be related to family cultural capital. In this manner, students’ high educational aspirations is assumed to be a proxy measure for the social value assigned to education and for the positive evaluation of the pertinence and possibility of remain in the education system (embodied cultural capital). In turn, the amount of time spent reading and doing school homework are assumed as measures reinforcing the educational aspirations. That is the greater the amount of time spent in these activities would imply a greater and actual effort towards the achievement of the manifested educational objective, and therefore an increment in the embodied cultural capital through the manifestation of positive dispositions towards learning.

The third group of variables is related to the students’ family structure and the social interactions and relationships among its members. The following table shows the variables included in this group and their descriptions.

Table 5. Family structure variables at the student level

Variable name	Description	Values	Measure
Both_parents	Who students live with	1=both parents, 0=otherwise	Nominal
academic_control	How often parents check on students’ homework and what they need for school	0=never, 1=sometimes, 2=frequently, 3=always	Ordinal
personal_control	How often parents know where students are when not in school	0=never, 1=sometimes, 2=frequently, 3=always	Ordinal
p_educational_asp	Up to what level parents expect students to study	1=lower-secondary, 2=secondary, 3=vocational education, 4=university, 5=postgraduate education	Ordinal

Risky_behaviour	Index constructed to measure the patterns of alcohol and tobacco consumption. (Maximum amount of cigarettes and alcoholic units consumed in a day)	Standardized variable with mean=0 and std deviation=1	Scale
conflicts_at_home	Index constructed to measure the frequency and length of conflicts at home	Standardized variable with mean=0 and std deviation=1	Scale

In order to frame the variables related to the family structure, the concept of social capital developed by Coleman (1988) will be used. From this author's perspective, social capital is part of a theoretical strategy that takes rational action as a starting point, but rejects the extreme individualistic premises that often accompany it by taking account of the social structure (James S Coleman, 1988: 95). Under this view, social capital is a resource for action over which actors have control. In other words, social capital is those aspects of the social structure that can be used by actors as resources to achieve their interests.

Along these lines, the social capital of the family is represented by the relationships among the family members that enhance the transmission of other structural resources like the parent's education, for example. That is, even if the parents have reached a high level of education, it would be irrelevant for their children's educational attainment if it is not complemented by social capital embodied in the family relations (Coleman, 1988: 105).

In this fashion, the physical absence of one or more parents is described by Coleman as a structural deficiency in family social capital and therefore it would be expected then to observe a better educational achievement for those students living in a family with both parents. However some more recent evidence reports contradictory results, Lauder and colleagues claim that "the often suggested deleterious effects of single parenthood are a function of income rather than family structure" (2008: 29). The variable "both_parents" reports precisely if the student lives with both parents or otherwise. Even when there is no information available to explore it, it is important to point out that according to Coleman, the absence of one or more parents could be replaced by other members of the family (e.g. grandparents), and that the presence of

both parents does not necessarily guarantee the interactions needed for the transmission of structural resources.

Other variables that are being taken as proxies to measure adult involvement in the family are: personal and academic control. These variables measure how often parents check on students, the first one regarding academic matters and the second regarding students' free time. According to the concept of social capital, it would be expected that the students receiving more academic and personal attention from their parents would achieve a higher educational attainment.

The variable measuring the parents' educational expectation for their children is also a proxy measure of the attention adults pay to their children, as it is assumed that parents who have higher academic expectations for their children would act in consequence. That is, the higher the academic expectations in a family the more the adults-children interactions focuses on transmitting the structural resources that would facilitate the achievement of this goal.

The variable "risky_behaviour" is also a measure of adult attention, as the consumption of alcohol and tobacco is illegal and is not socially acceptable for 15 years old children. It is assumed that children reporting higher levels of alcohol and tobacco consumption would receive less adult attention.

Finally, the variable measuring length and frequency of conflicts at home is included in this block because it is considered that a family climate with fewer conflicts is more propitious for the interactions needed for the transmission of structural resources that would favour a student's better academic performance. In this way, families with a lower index of conflicts would observe better education results in their members.

The last group of variables is related to the physical and emotional conditions affecting the educational opportunities of the students. The variables forming this group are shown in the next table.

Table 6. Opportunities to learn at the student level

Variable name	Description	Values	Measure
students_absenses	Number of absences last two months	0=none, 1=1 to 3, 2=4 to 7, 3=8 to 15, 4=16+	Ordinal
teacher_absenses	How often teachers are absent	0=never, 1=sometimes, 2=frequently, 3=always	Ordinal
school_books	If students have had the books needed for school	1=yes, 0=no	Nominal
housework	Number of hours spent in housework per day	0=none, 1=up to 2, 2=between 2 and 3, 3=between 3 and 4, 4=between 4 and 5, 5=more than 5	Ordinal
bully	If students are victims of bullying	1=yes, 0=no	Nominal

According to McDonell (1995) the concept of opportunities to learn (OTL) was first coined some 40 years ago by the International Association for the Evaluation of Educational Achievement (IEA). The concept of OTL was created as a technical tool to ensure validity of cross-national comparisons in educational studies carried out by the IEA, as it was evident that when comparing student achievement across different education systems the differences in the curriculums had to be part of the equation. In this manner, in report on the First International Mathematics Study (FIMS), Husen (1967) provides what nowadays is one of the most popular definitions of OTL: "One of the factors which may influence scores [...] is whether or not the students have had an opportunity to study a particular topic or learn how to solve a particular type of problem ..." (p. 162). The definition is quite straightforward; however, as the concept has been transformed from a technical tool to a policy concept, it has been expanded to include not only the overlap between what is taught and what is tested, but also other factors that condition the learning opportunities for all students. Banicky, for example, points out that, though difficult to measure and very often controversial, most of research agree that measures of OTL should include at least the following dimensions (Banicky, 2000: 3): i) curriculum (e.g. the overlap between what is taught and what is tested); ii) instructional quality (e.g. teacher's experience and qualifications, teacher's planning for lessons); iii) time (e.g. teacher attendance, actual duration of lessons); iv) resources (e.g. adequate premises, access to text books and other pedagogical materials); and v) school climate (e.g. safe and orderly learning environment).

Even though in would have been desirable to count on information to measure the OTL through the lenses of the actual implemented curriculum, the variables available for this work only contain information to measure the other four dimensions. Also, it is important to mention that the information regarding the teachers' characteristics and practices that mediate the students' OTL will be analysed in the school variables section.

In this fashion, the first two variables refer to the dimension of time; they measure the number and frequency of absences of teachers and students, respectively. It is assumed that the absences of the teacher or the student will affect the time students spend learning the contents of the curriculum and therefore their opportunities to learn certain topics that might be included in the exam. In this way, the absences of teachers and students would be negatively related with the students' educational attainment.

The third variable refers to the dimension of resources, and measures whether or not the students had the books they needed at their disposal[13]. Obviously, it is expected that not having the text books necessary to follow what is taught in school will affect negatively the students' educational attainment.

The variable "housework" is also related to the amount time students have available for learning activities. This variable, in particular, measures the time students spend helping with household chores. Again, it is assumed that the more the time students spend in this activities will affect the time the have available to study or doing school homework at home. Thus, it is expected that this variable will be negatively related to the students' educational attainment.

Finally, the variable reporting whether students are victims of bully is related to the safeness and appropriateness of the learning environment. According to the results commonly found in empirical research (e.g. Boulton & Underwood, 1992; Farrington, 1993; Fonagy, Twemlow, Vernberg, Sacco, & Little, 2005), bully affects in a negative way the emotional conditions and motivation to go to

[13] Although since 1997 the Ministry of Education established the Program of Distribution of Free Textbooks for Lower-Secondary (El Programa de Distribución de Libros de Texto para Secundaria) (CONALITEG, 2007), in the datasets used for this work 15.4% of students reported they did not had the text books they needed during the school year 2004-2005 with no significant differences among public and private schools.

school of its victims, and as a consequence is negatively associated to educational attainment. The research developed by Farrington, for example, found that “victims of bullying tend to be unpopular and rejected by their peers, and tend to have low school attainment, low self-esteem, and poor social skills” (Farrington, 1993: 383). So, for this study it is also expected a lower educational attainment for the students who report to be victims of bullying.

4.2.2 School level variables

The range of theories available to explain the relationship between the variables measured at the school level and the educational outcomes are more diverse and, at the same time, have received less attention from the school effectiveness academic community. Among the possible options to develop a theoretical framework for the school level variables, attention has been called to the similarities between schools and other organisations, particularly those in the service industry (Charles Teddlie, Reynolds, & Pol, 2000), and therefore to the relevance of the Organisational Theories. Furthermore, some interesting developments have been made in this direction, for example Bennet (2001) explored some concepts of organisation theory in order to propose a model of school as organisation that creates synergy between the school effectiveness and school improvement movements; Blanco (2007) and Fernandez (2004) used the categorisation of organisation theories provided by Scott (2003) in order to develop models of educational effectiveness. For this work, I will use this categorisation as a general framework for the group of school variables and some other more specific theories/hypothesis for justifying the inclusion of particular variables in the analysis.

In this way, I will present first a brief account of the three major views or organisational models described by Scott (Op. cit.) and a general description of how a combination of these can be used to provide a framework for the theoretical related groups in which the school variables are organised. According to Scott, organisations can be classified as rational, natural and open systems. Even though I consider it is important to briefly describe the three of them in order to have a panoramic vision of the school’s position in the social

map; it is also important to say that given the limitations of the empirical information available, it will not be possible to test all the dimensions proposed by the organisational framework[14].

From the *rational* perspective organisations are mainly defined by their orientation to specific goals and the formalisation of rules and roles within their members. From this perspective organisations acquire an instrumental character; that is, they are seen as a formalised rational mean created to reach certain objectives.

In this way, the structure of the organisation is shaped and the tasks it performs are selected according to the goals the organisation pursues. The rules to be followed and the roles in which members have to fit also respond to the objectives set for the organisation.

According to Scott (Op. cit), the four main schools of thought within the rational approach are: Frederick Taylor's scientific management theory, Henri Fayol's theory of administrative management, Max Weber's theory of bureaucracy and Herbert Simon's theory of administrative behaviour. And among these, the theory of bureaucracy is especially relevant for this study as the Mexican education system's design follows a rather optimistic bureaucratic rationality (Blanco, 2007).

That is, in general terms, it is assumed that the pyramidal structure of the system and its bureaucratic controls will guarantee that the guidelines, principles and policies originated in the centre will work in every school and in every classroom. Moreover, with some exemptions, it is further assumed that every child in every school can and will be taught the same contents of the same curriculum.

Now, in Mexico, regardless the decentralisation of education that took place in 1992, the prevalence, to some extent, of a concentrated and highly hierarchal

[14] In particular I am refereeing here to the relationships between schools and the higher levels of the bureaucratic structure of the education system. Different attempts were made to include this kind of information from different sources, however the variables constructed showed not to be significative in the statistical models.

structure of power and authority (Tatto, 1999) makes the rational perspective an adequate approach to analyse the relationships among the higher levels of the structure (i.e. federal government, teacher's union, states, etc.) and between those and the schools.

However, if we stick to the concept of school discussed in chapter 2[15], it is clear that the whole education system cannot be explained solely through the rational perspective lenses. It is here where the perspective of organisations as *natural* systems comes into play.

Following Scott (Op cit), the natural perspective conceives organisations as fundamentally social groups adapting and surviving in a set of particular circumstances. Opposite to the rational approach, under this perspective, organisation members are not passive individuals regarding the structure and demands of the educational system, but they do have objectives, motivations and interests on their own. The mechanistic structure proposed by the rational perspective is substituted by an organic one in the natural approach. That is, according to the natural perspective organisations do not obey a rational pre-design with a specific objective, but they organically evolve in order to adapt to their internal and external circumstances and to the formal and informal relationships among their members.

Given that the formal and informal relationships between the actors in the education system (i.e. students – teachers – head-teachers – union representatives – zone supervisors – directive staff at the local, state and federal level – etc.) cannot be disassociated, the natural approach is clearly pertinent to analyse the schools as organisations. This perspective is especially relevant to analyse concepts like school climate, school management and head-teachers' leadership.

Scott (Op cit) points out four major natural system schools of thought: the Chester Barnard's view of organisations as cooperative systems, the Philip

[15] "Schools are complex, contradictory sometimes incoherent organisations like many others. They are assembled over the time to form a bricolage of memories, commitments, routines, bright ideas and policy effects. They are changed, influenced and interfered with regularly and increasingly. They drift, decay and re-generate." (Ball, 1998b: 317)

Selznick's institutional approach, Elton Mayo's human relations movement and Talcott Parson's AGIL[16] scheme.

Finally, the third organisational model proposed by Scott (Op cit) focuses on the bounding ties between the organisation and its environment. This perspective assumes that organisations and their parts or subsystems are shaped by their interaction with the environment surrounding them. Additionally, the subsystems constituting the system are considered to be semi-autonomous (e.g. they can exchange information, make decisions and direct their actions) and the boundaries between the subsystems and between the system and other systems are considered to be blurry. Another central feature of this view is that organisations are seen as having important and extended interdependencies between their subsystems, where these interdependences are characterised for showing different degrees of coupling.

Within the open systems perspective, Scott (Op cit) describes the following schools of thought: the Kenneth Boulding's general systems theory, Nandish Patel's theory of deferred action (systems design), Fred Fiedler's contingency theory and the Karl Weick's model of organising.

The open systems perspective is then very useful to understand the relationships of the schools to the environment in which it is embedded. In particular, given the already mentioned structural characteristics of the Mexican education system, this approach provides appropriate tools for analysing the relations between schools and the other systems influencing them from the exterior; namely the formal administrative structure of the education system, the National Teachers' Union, and other community and social actors (e.g. associations of parents or non-governmental organisations).

Even though this classification of the organisational theories is useful to point out how they can contribute to the analysis of the schools and the education system, it is also obvious that there is not a single theory, nor even a single approach (i.e. rational, natural, and open) which can claim to have reached

[16] AGIL is an acronym which stands for the needs that, according to Parsons, an organisation must meet if it is to survive, namely: Adaptation, Goal attainment, Integration and Latency (McNeill & Townley, 1981).

enough consensus about what an organisation is, nor how it should be analysed (Bennett, 2001). Therefore, as it has been implied above, different parts of the different approaches will be used to analyse different dimensions of the school, the structure in which it is embedded and the relationships among the actors and subsystems.

In this way, the different organisational theory approaches can be said to be more suitable for different levels of the educational system; that is, they can be used to address different dimensions and different sets of relationships. In this manner, the rational approach can be used to analyse the actors in the higher levels of the hierarchy (i.e. federal, regional and local administrations and the national teacher's union), as the bureaucratic structure in which are embedded and the relationships among them respond well to the mechanistic view proposed by this approach. In turn, the natural approach (and the open systems, to certain extent) can be used to analyse the relationships that take place within the schools, as its fundamental assumptions clearly coincide with the definition of school as organisation proposed before in this work. The open systems approach, on its own, can be used to analyse the relationships of the school and its constituting parts with the systems constituting the schools environment.

For this work, the variables at the school level are grouped in five theoretical related blocks: school composition variables, school resources, school climate, school management and learning opportunities. The next table shows the variables included in the first group[17].

[17] In the next tables, the first four characters in the name of each variable provide information to know from what questionnaire they are from. So for example, variables which name start by "s_s_" correspond to student level variables aggregated to the school level, "s_t_" are from the teachers questionnaire and correspond to the average value for the teacher in a given school, and the prefix "s_h_" correspond to variables from the head-teachers' questionnaire.

Table 7. School composition variables

Variable name	Description	Values	Measure
s_s_extra_age	Percentage of students with extra-age in the school	From 0 to 82	Scale
s_s_indigenous_language	School aggregated index constructed to measure the use of an indigenous language	Standardized variable with mean=0 and std deviation=1	Scale
s_type_of_school	Type of school students are attending to	1=general, 2=vocational, 3=tv, 4=private	Nominal
s_s_work_out_home	School aggregated index constructed to measure the time spent by students working out of home	Standardized variable with mean=0 and std deviation=1	Scale
s_s_socioeconomic_capital	School aggregated index constructed to measure the family's cultural and economic capital.	Standardized variable with mean=0 and std deviation=1	Scale
s_t_economic_capital	Index constructed to measure the teacher's economic capital. Contains variables like goods and services present in the teachers' household.	Standardized variable with mean=0 and std deviation=1	Scale
s_s_educational_aspirations	School aggregated variable measuring the average educational aspirations of students in a school.	1=lower-secondary, 2=secondary, 3=vocational education, 4=university, 5=postgarduate education	Ordinal
s_p_educational_aspirations	School aggregated variable measuring the average educational aspirations of students' parents in a school.	1=lower-secondary, 2=secondary, 3=vocational education, 4=university, 5=postgarduate education	Ordinal
s_s_risky_behaviour	School aggregated index constructed to measure the patterns of alcohol and tobacco consumption.	Standardized variable with mean=0 and std deviation=1	Scale

The first two variables in this group, i.e. s_s_extra_age and s_s_indigenous_language, are related to school aggregated demographic characteristics of the students in a given school. The third, s_type_of_school, has to do with a series of formal characteristics and rules of the school and the bureaucratic structure in which schools are embedded; but also with the socioeconomic and cultural composition of the school, as in the Mexican case there is empirical evidence showing that students with higher levels of economic, cultural and social capitals tend to enrol in private and general

schools, whereas students with low capital levels are more commonly found in vocational schools and telesecundarias (Cf. T. Fernández, 2004). The next three variables are concerned with the economic and cultural composition of the school: s_s_work_out_home and s_s_socioeconomic_capital are related to the students' characteristics, and s_t_economic_capital to the average economic capital of the teachers in a given school[18]. Finally, the last three variables regard the school normative environment, particularly the aspirational environment formed by the students and their parents' educative expectations and the average of alcohol and tobacco consumed by students as a proxy measure of the attention and supervision they receive from adults.

The importance of this group of variables lies on the empirical evidence that shows that, independently from the influence of the students' socioeconomic and cultural characteristics, there is an important incidence of the characteristics of the context at the school level (Blanco, 2007). Some authors go even further, according to Thrupp (1999) for example, much of the so-called school effect found by SER studies may not reflect a school's effectiveness at all, but may be indirectly related to student-composition characteristics.

Different hypotheses have been developed to explain how these compositional effects operate over educational results. For example Alexander and colleagues (1979), offered two non-exclusive explanations to account for this relationship: the first one holds that the socioeconomic composition of a school is closely related to a normative environment, being some normative environments more favourable to the educational results than others. The second explanation emphasizes the implications of students' aggregated socioeconomic status for the quality and character of peer networks.

These two explanations can be taken forward by linking them to the theories used to frame the variables included at the student level. This point is very important because in order to develop a comprehensive theory that gives an account of how schools work and how they can improve their performance, it is necessary that this theory integrates its postulates with the postulates of the

[18] In contrast to the students variables, the economic and the cultural capital of teachers were not merged into one variable because there is no information available about the teacher's cultural capital.

theories that explain the educational results at the student level. For the variables in this group the concept of *habitus* developed by Bourdieu is clearly a useful one, especially its duality as both collective and individualised. According to Bourdieu (1999), the social order and psychological processes are normally characterised by their homology, redundancy and mutual reinforcement. In other words, a *habitus* is normally embedded by a social world of which it is the product, therefore the individual who posses this habitus feels comfortable, does not feel the weight of the world and take the world about it for granted (Bourdieu & Wacquant, 1992; in Reay, 2002).

In turn, these concepts can be applied to the notion of normative environment mentioned before, and therefore can be used to analyse the socioeconomic and cultural compositional effects on the individual educational performance from an open systems perspective. That is, when a student's *habitus* is contained –is a product of, the school's normative environment, the student will feel comfortable and the climate will be favourable for the pedagogical process. However, it is more interesting for the effects of this research the cases in which there are tensions and contradictions between *habitus* and normative environment, that is to say that when there are students enrolled in schools with a socioeconomic and cultural composition higher than their individual levels. Such tensions would produce what McDonough calls *institutional habitus*, namely the impact of a cultural group, a social class or a series of formal characteristics and rules belonging to a bureaucratic structure on an individual's behaviour as it is mediated through an organisation [school] (McDonough, 1996).

Although Thrupp (1999) does not uses the concept of *institutional habitus* in an explicit way, his idea of middle-class/organic, working-class/inorganic relations between home and school can be used to make the point about how power relations between different social classes within schools are of central importance for explaining the differences in school outcomes (Reay, David, & Ball, 2001). Following Thrupp (Op cit), schools develop processes that reflect their socioeconomic and cultural composition. In that way mainly middle class schools would have supportive student cultures which would allow them to have smooth pedagogical processes and management. On the other hand, socially disadvantaged students who attend a school with low socioeconomic and

cultural composition would often fail not only because of the constraints imposed by their own background but also because their school cannot offer middle class types of school resources and processes. In this order of ideas, socially disadvantaged students who attend a middle class school would be more likely to succeed because they are exposed, despite their individual class backgrounds, to the contextual benefits of a middle class school.

In this fashion, for this work the socioeconomic and cultural composition of a school (i.e. the school aggregated measures of the time spent by students working out of home, of their socioeconomic and cultural capital and of the average economic capital of the teachers in the school) and the formal characteristics and rules corresponding to its bureaucratic structure (i.e. type of school) are assumed to be proxy measures of those factors producing specific institutional *habituses*; and therefore are seen as an important part of the factors shaping the relationship among the school actors and subsystems and between the schools and their context.

The argument developed on the socioeconomic and cultural composition can be extended to the other variables in this group. That is the school aggregated measures of the demographic characteristics of the intake, namely the average of students with an age over the normative one for the course they are taking and the proportion of indigenous students in the school. Based on the empirical evidence that show the negative relationship between these variables at the individual level and the educational performance (see for example F. J. Murillo & Román, 2009), it could be assumed that in schools with low proportions of students over the normative age and / or belonging to an indigenous group, individuals belonging to these minorities would be more likely to establish friendships with classmates who do not share their demographic and cultural background and therefore to get influenced by a positive institutional habitus. However, for these particular variables, it is acknowledged that there are some other factors that could revert the relationship; ethnical discrimination for the indigenous students and a low self educational expectations as a result of past educational failure for the students with an age over the normative one.

In the same manner, it can be said that every student's performance is not only influenced by his/her own educational aspirations, but also by the average educational aspirations of the other students in the school. This influence would be part of the institutional habitus too, and would be positive if the student has lower aspirations than the average in the school, and negative otherwise. In this way, the average educational aspirations of the parents for the students and the amount of alcohol and tobacco consumed by the students (as a proxy measure of the time parents spent with students) are also taken into consideration, as it is assumed the attitudes of parents towards education and the supervision received by students not only have an effect at the individual level, but also form part of the institutional habitus in a given school.

The next group of variables is related to the resources available for a school. These variables, as it is explained below, are divided into material and human resources. The next table shows the variables belonging to this group.

Table 8. School resources variables.

Variable name	Description	Values	Measure
s_t_classroom_conditions	School aggregated index constructed to measure the availability and physical conditions of equipment in classrooms according to teachers.	Standardized variable with mean=0 and std deviation=1	scale
s_t_school_equipment	School aggregated index constructed to measure the existence and condition of goods, materials and equipment available in school according to teachers.	Standardized variable with mean=0 and std deviation=1	scale
s_h_infrastructure	Index constructed to measure the existence, sufficiency and condition of materials, equipment and buildings in the school according to the head-teacher.	Standardized variable with mean=0 and std deviation=1	scale

s_t_level_of_studies	Average teachers' maximum level of studies.	1=Primaria, 2=Secundaria, 3=Bachillerato o preparatoria, 4=Normal básica sin licenciatura, 5=Normal superior, 6=Licenciatura en Escuela Normal, 7=Licenciatura en otra institución de educación superior, 8=Especialidad, 9=Maestría, 10=Doctorado	ordinal
s_t_years_as_teacher	Teachers' average number of years working as a teacher.	From 0 to 55	scale
s_t_years_same_school	Teachers' average number of years working as a teacher in the same school.	From 0 to 44	scale
s_t_PCM	Percentage of teachers is registered in the Programa de Carrera Magisterial.	From 0 to 100	scale
s_t_other_job	Percentage of teachers with another paid job.	From 0 to 100	Scale
s_t_trainning	Average of the number of courses taken by the teachers in the last two years.	0=none, 1=1, 2=2, 3=3, 4=4, 5=5+	Ordinal
s_h_level_of_studies	Head-teachers' maximum level of studies in the school.	1=Primaria, 2=Secundaria, 3=Bachillerato o preparatoria, 4=Normal básica sin licenciatura, 5=Normal superior, 6=Licenciatura en Escuela Normal, 7=Licenciatura en otra institución de educación superior, 8=Especialidad, 9=Maestría, 10=Doctorado	Ordinal
s_h_years_as_headteacher	Number of years working as a head-teacher.	From 0 to 50	Scale
s_h_years_same_school	Number of years working as a head-teacher in the same school.	From 0 to 50	Scale
s_h_PCM	If head-teacher is registered in the Programa de Carrera Magisterial.	1=yes, 0=no	Nominal
s_h_other_job	If head-teacher has another paid job.	1=yes, 0=no	Nominal
s_h_trainning	Number of courses, related with their work as head-teachers, taken in the last two years	0=none, 1=1, 2=2, 3=3, 4=4, 5=5+	Scale

The first three variables then, namely s_t_classroom_conditions, s_t_school_equipment and s_h_infrastructure, measure the perception of teachers and head-teachers regarding the existence, sufficiency, and physical conditions of classroom and school infrastructure.

Currently, there is a debate on whether or not school infrastructure has an effect on educational attainment. There are several works supporting the existence of such effects in Latin America (e.g. Barbosa & Fernandes, 2001; Blanco, 2007; Cano, 1997; Concha, 1996; T. Fernández, 2004; Piñeros & Rodríguez Pinzón, 1998). Among them, Blanco (2007), by analysing national Mexican data from primary education, suggests that school infrastructure favour or restrict the actions of the staff and thus their efficiency. Following Blanco, it can be said that, especially in Mexico, the lack of adequate infrastructure requires a great amount of the head-teachers' time and therefore distracts them from other substantial managerial activities. In turn, Fernandez (2004), also with Mexican data, considers that the conditions of the physical space in which the pedagogical process takes place affects the possibility of constructing positive school experiences and collective identity. Another example, this time drawing on data from several countries in Latin America, Murillo and Roman (2009) also found a positive relationship between infrastructure and educational achievement.

However, in the developed countries, the evidence points in the opposite direction (see for example Schagen & Weston, 1998; Scheerens, 2000). One way of explaining this contradictory evidence is the most often homogeneous distribution of basic educational provisions in terms of facilities and equipment are in the developed countries (Scheerens, 2000: 90).

In this way, for this research it is expected to find a positive relationship between the variables measuring the school infrastructure and the educational outcomes.

The next sub-group of variables corresponds to the characteristics of the human resources the schools can count on to develop their activities. Specifically, the variables considered measure the following characteristics of teachers and

head-teachers: maximum level of studies, participation in training activities, professional experience, stability in the school and if the school staff has another paid job.

The number of years working as teacher or head-teacher is used as a proxy measure for experience. The training will be measured through the number of courses, related to their profession, taken by the school staff in the last two years; by their maximum level of education and through their participation in the Programa de Carrera Magisterial[19]. These factors are deemed to be important because, as common sense suggests, training is required in order to expect quality services from a teacher, a head-teacher or any other professional. Furthermore, they mediate the development of teachers and head-teachers' both general and professional education; an awareness of the principles which underlie good human relations; a sense of responsibility to contribute, both by teaching and by example, to social, cultural and economic progress; and ultimately to their ability to educate others (UNESCO, 2006: 51). Additionally, as Blanco (2007) points out, experience, training and school climate can have a joint effect over student achievement through innovation and exchange of knowledge and pedagogical practices among the school staff.

It is expected then, that higher levels of training and experience of the teachers and head-teacher(s) would be related to a better educational achievement of their students.

The stability of the school staff is measured by the number of years the teachers and head-teachers have worked in the same school. It is considered that the stability of the school staff would favour the development of a positive school climate and therefore have a positive effect over the school outcomes. That is, from a naturalistic perspective, the stability would facilitate the adaptation of the different members of the organisation to the particular circumstances in which a given school operates. It would make it possible for the members of the organization to adopt the behaviour patterns observed as

[19] The Programa de Carrera Magisterial is a programme intended to give recognition to teachers and to provide economic incentives for superior teaching performance, being the amount of training carried out by its beneficiaries one (maybe the main) of the criteria to evaluate performance. It was implemented as a result of the National Agreement for the Modernization of Basic Education signed by the federal government, state governments, and the national teachers' union (Santibanez, et al., 2007).

part of the school culture, to participate effectively in the communication networks or to form new ones, to understand and internalise the operating status and power system and, ultimately to reach successful working arrangements. This could mean that the inclusion of school climate as another variable in the analysis would diminish or even wipe off the effect of stability, however there are some evidence that show significative effects of stability when both variables are considered (e.g. Cano, 1997; Concha, 1996; Herrera & López, 1996; LLECE, 2001).

The staff stability would also be important form an open systems perspective, as the longer the teachers or head-teacher are in a school, the more the chance they would have to understand and participate of the local culture and the specific problems of the community. The school staff would have more opportunities to develop the reciprocal ties that would bind the school to its environment, for example to promote the participation of parents in school activities.

In this fashion, it would be expected staff stability to be positively related to student achievement.

Finally, it was decided to include a proxy variable for the time the teachers and head-teacher have available to work in the school, that is if they have another paid job apart form working in the school. The justification for the inclusion of this variable is similar to those explained above. If teachers have another job it would affect the time they have available to spend working on preparing lessons, reviewing and giving feedback to student homework, for example. It would also affect the time school staff have available to develop informal relationships and their participation in out-of-school-time activities. In this manner it is expected that the students of teachers and head-teachers would have lower educational attainment.

The third group of school variables is related to the school climate. These variables are also measures obtained from the perceptions of teachers and head-teachers on different factors that can be theoretically related to the wide

concept of school climate. It also includes an aggregated variable from the student level. The next table shows the variables included in this group.

Table 9. School climate variables.

Variable name	Description	Values	Measure
s_t_laboral_satisfaction	School aggregated index constructed to measure the level of agreement / satisfaction with relationships and other academic and physical aspects in the school	Standardized variable with mean=0 and std deviation=1	scale
s_t_comm_trust	School aggregated index constructed to measure the teachers' perceptions about communication and trust among staff	Standardized variable with mean=0 and std deviation=1	scale
s_t_supp_agree_expec	School aggregated index constructed to measure the teachers' perceptions about academic expectations for students, support from colleagues and agreement among staff	Standardized variable with mean=0 and std deviation=1	scale
s_h_laboral_satisfaction	Index constructed to measure the level of agreement / satisfaction with relationships and with other academic and physical aspects in the school.	Standardized variable with mean=0 and std deviation=1	scale
s_h_school_climate	Index constructed to measure the head-teachers' perceptions about support, trust, motivation, friendship, team work, agreements and conflicts among staff in the school.	Standardized variable with mean=0 and std deviation=1	scale
s_t_risky_neighbourhood	Index constructed to measure the teachers' perceptions about alcohol and drugs consumption in the neighbourhood.	Standardized variable with mean=0 and std deviation=1	scale
s_s_risky_behaviour	School aggregated index constructed to measure the students' patterns of alcohol and tobacco consumption	Standardized variable with mean=0 and std deviation=1	scale
s_h_parents_involvement	Index constructed to measure the parents' participation in school activities.	Standardized variable with mean=0 and std deviation=1	scale
school_size	Number of students in the school.	From 0 to 9932	scale

The study of the relationship between school climate and students' performance can be traced back in time as far as the work carried out by Perry (1908) about the management of city schools (CSEE, 2008). After that, the systematic study of climate was first developed by organisational studies and then adopted by school effectiveness research as one of its most important concepts (Tabaré Fernández, Banegas, Blanco, & Méndez, 2004). There is a vast amount of empirical evidence showing significative effects of school climate over school outcomes. In the developed countries some examples are: Edmonds (1979), Rutter and colleagues (1979), Mortimore and colleagues (1988), and Bryk and colleagues (1993). In Latin America some recent works that have found similar results are the ones developed by Concha (1996), Piñeros and Rodriguez (1998), Barbosa and Fernades (2001), and the LLECE team coordinated by Valdes (2008). Yet, in most of these studies the concept has been operationalised in different ways, considering different elements and none of the many definitions that have been proposed has been able to reach consensus among the educational research community. This is the reason why, maybe the only common characteristic of the multiple definitions of school climate is that all of them refer to a subjective experience in school (Cohen, 2006).

However, a comprehensive and concise literature review produced by the Centre for Social and Emotional Education on the topic suggests, based on Cohen (2006: 212), that there are at least ten overlapping dimensions that shape this subjective experience in school, namely:

1) Structural issues (e.g., size of the school);
2) Environmental (e.g., cleanliness, adequate space);
3) Social-emotional and physical order and safety;
4) Expectations for student achievement;
5) Quality of instruction;
6) Collaboration and communication;
7) Sense of school community;
8) Peer norms;
9) School-home community partnerships; and
10) Student morale;

If a close comparison is made between the this list and the description of the variables in the table above[20], it can be found that all of the dimensions suggested by Cohen (Op cit) to measure school climate have a correspondence with the variables included in this work. In this way s_t_laboral_satisfaction corresponds to the points 2 and 10, s_t_comm_trust to the number 6, s_t_supp_agree_expec to the points 4 and 10, s_h_laboral_satisfaction to the number 5, s_h_school_climate to the points 6 and 7, s_t_risky_neighbourhood to the number 3, s_s_risky_behaviour to the number 8, s_h_parents_involvement to the number 9, and school_size to the point 1.

Now, the effect of these variables over the student attainment has to be analysed again from a natural systems perspective, because the concept of school climate itself assumes that the actors that generate the subjective experience of school (i.e. school climate), participate in the organisation as "wholes", that is acting not only in terms of their formal roles, but integrating at the same time a complex informal system of social meanings that link together individuals within and external to the organisation (Cf. Selznick, 1948). Additionally, this notion can be combined to that of loose coupling (Weick, 1976) in the sense that all these elements are considered to be important for a favourable school climate, but not all of them are indispensable, i.e. different configurations can produce the same or different results depending on the particular context of each school; and there is an absence of formal rules when it comes to the social relationships among the members of the school and between them and the school's environment.

In this way, it is expected that the educational achievement will be positively related to factors as labour satisfaction; good levels of communication, trust, support and agreements among staff; high expectations on students; high levels of parents participation in school activities. Conversely, the educational achievement would be negatively related to factors like perception of an unsafe neighbourhood, high levels of tobacco and alcohol consumption among students and school size.

[20] Information about the items composing each index can be found in the Annex C

The last factor is an interesting one as it has been extensively analysed from different organisational perspectives with contradictory conclusions (Tabare Fernández, 2007). From a rational perspective, it is said that the bigger the school the more the human, material and financial resources it will have to cater for the different needs of its students. In that way a big school would have more chances to be more efficient than a small one. From an open systems perspective, the size of the school can be related to its ability of adaptation to the characteristics of the environment. That is to say that a big school would be able to create different departments to deal with different sectors of the environment (e.g. a purchasing department). In this way, a big school would have greater possibilities to adapt itself to the environment, but at the same time it would generate a high interdependence among the parts or departments of the school, and also interest of each department to maintain itself. Therefore it would affect its capacity for transformation. Finally, from a natural systems perspective, the size of the school would represent different setting for the informal relations among the staff and students. A small school would favour the personalisation of the relationships, the possibility to reach consensus among staff in academic issues and the informal interaction among the members of the school. Among the three perspectives, the last one will be used as it has clear coincidence with the definition of school used for this work.

The next group of school variables is related to the school management. These variables were obtained from the answers of head-teachers about their management practices and include administrative controls; administrative, academic and pedagogic support offered to teachers and other staff; and administrative planning. The variables included in this group are shown in the next table.

Table 10. School management variables.

Variable name	Description	Values	Measure
s_h_admin_controls	Index constructed to measure to what extent head-teachers track academic outcomes, school calendar, timetables, and teachers' attendance and punctuality	Standardized variable with mean=0 and std deviation=1	scale
s_h_admin_planning	Index constructed to measure the efficiency of the school project and existence of internal administrative organs and regulations.	Standardized variable with mean=0 and std deviation=1	scale
s_h_consultancy	Index constructed to measure the what extent head-teachers offer consultancy to teachers	Standardized variable with mean=0 and std deviation=1	Scale

School management has been a central characteristic of the effective schools almost since the very beginning of SER. The Edmond's "five factors" are an example of this (Edmonds, 1979). After that, some other significant studies showing the importance of school management are, for example, Creemers (1994), Rosenholtz (1985) and Rowan (1983); in Latin America the extensive literature review about studies in the region carried out by Murillo and colleagues (2007) provides good evidence in this respect; the results of the Second Comparative and Explicative Regional Study (SERCE, by its acronym in Spanish) carried out by the LLECE team are another relevant example (Valdés, et al., 2008).

However, the operationalisation of this concept presents similar problems to those of school climate: there is no consensus about what factors have to be included. Fortunately there are some works that present the concept in a coherent, theoretical based and contextualised form. This is the case of the study carried out by the General Direction for Evaluation of the Ministry of Public Education in Mexico (DGE-SEP by its acronym in Spanish). In this work (SEP, 2001), the DGE presents a synthesis of 128 case studies carried out in primary schools, the objective was to find pathways to improve schools' performance through their pedagogical and management practices. In the section of findings, the most recurrent school management characteristics of effective schools are presented; this model of school management was

denominated *academic leadership* and was based on the weight and legitimacy of the head-teacher's leadership, the frequent diagnosis of students' academic outcomes, monitoring of academic and pedagogical processes, and clear communication of improvement plans.

As it can be inferred from the discussion above, this group of variables needs to be analysed from different organisational perspectives too. On the one hand, it is clear that all the concepts related to the bureaucratic structures and formal roles and rules would fit well in the rational systems approach; yet, on the other hand, from a naturalistic perspective it is clear that the informal social relations, the social constitution of leadership and the micro-politics of the organisation cannot be left out of the analysis.

Along these lines, based on the DGE's characterisation, three indices were constructed to obtain proxy measures for measuring to what extent head-teachers evaluate the students' and teachers' performance (i.e. s_h_admin_controls); the efficiency of the *school* [planning] *project*[21] and therefore of the flow of information to the different actors of the school and its environment (i.e. s_h_admin_planning); and the amount of consultancy / training the head-teacher provide to the teachers in the school to proxy the centrality and legitimacy of his/her leadership (i.e. s_h_consultancy).

In this way, it would be expected to find positive relationships between these three indices and the students' achievement.

Finally, the last group of school variables is referred to the use of educative resources and other pedagogical practices that teachers put in place to enable their students to meet the learning expectations set by the curriculum; in other words, those actions carried out by teachers that modify the students' learning opportunities. The next table shows the variables included.

[21] The concept of *school project* (proyecto escolar) was introduced in 1992 as part of the National Agreement for the Modernisation of Basic Education (ANMEB by its acronym in Spanish). It is meant to be a planning tool for the school. Among it guidelines it contemplates the creation of councils at the school, municipality and state levels in which parents, community members and school staff are represented.

Table 11. Opportunities to learn at the school level.

Variable name	Description	Values	Measure
s_t_educative_resources	School aggregated index constructed to measure the availability and frequency of use of different educative resources	Standardized variable with mean=0 and std deviation=1	scale
s_t_time_preparation	Average of hours spent by teachers preparing their lessons every week	1=5 hours or less, 2=6 to 9 hours, 3=10 to 14 hours, 4=15 hours or more	ordinal
s_t_work_plan	Percentage of teachers who elaborated a work plan for the current academic year	From 0 to 100	scale
s_t_homework_feedback	Average percentage of the homework handed-in by students teachers review in a normal week	1=Less than 25%, 2=25 to 50%, 3=51 to 75%, 4=More than 75%	ordinal
s_t_teacher_absent	Average of days teachers didn't give lessons to their groups in the year	0=none, 1=1 to 2, 2=3 to 5, 3=6 to 10, 4=11 to 15, 5=16 or more	ordinal

As was mentioned before (see student level variables above), the OTL are composed of several dimensions, namely curriculum, instructional quality, time, resources and school climate. Among those, the variables in this group refer to the answers of teachers about the availability and the frequency of use of educational resources, the time teachers spend preparing their lessons, the percentage of teachers who develop a plan for the academic year, the percentage of homework that is reviewed and commented by teachers and a measure of teachers' absenteeism.

Empirical evidence of the importance of these variables in relation to student educational achievement can be found in several works in the literature (see for example Herman & Klein, 1997; Schmidt & McKnight, 1995; Winfield & Woodard, 1994). In Latin America, even though the concept is not as popular as in the developed world, a couple of good examples of research that add evidence to the importance of OTL for educational attainment are the works of Ruben Cervini in Argentina (2001) and Santiago Cueto and GRADE (Grupo de Analisis para el Desarrollo) team's evaluation of OTL in Peru (Cueto, Ramirez, Leon, & Pantin, 2003).

In this way, it is expected that for the present work the OTL expressed in the frequent use of educational resources, the existence of a work plan for the academic year, the time teachers spend preparing their lessons and the feedback teachers give on homework will be positively related to the educational achievement; while, the teachers' absenteeism would have a negative relation with the same dependent variable.

5. Data analysis. Establishment of Contextually-Based Robust Data Patterns

The establishment of contextually-based robust data patterns is the first stage of the analysis proposed by ATOM. To reach this objective, this stage is divided into four phases. The first one is an Initial Exploratory Data Analysis to clarify the structure of the data and to assure their quality and suitability for the analysis intended; the next phase is a Core Data Analysis using Multilevel Models to identify data patterns in the effect of school and context related variables on student achievement (analytical questions 1 to 4); the third phase is a Close Replication of these results by comparing them to other studies using the same datasets; and the last phase is a Constructive Replication by comparing the results to the ones of other studies using different datasets but with similar objectives. The result of this first stage will be the establishment of contextually-based robust data patterns regarding the factors associated to educational attainment in the Mexican lower-secondary schools.

5.1 Initial Exploratory Data Analysis

This stage consists in an informal examination of the data to be used before starting the main analysis. For this work, it involves processing the data in a suitable way for the analysis by testing for recording errors (e.g. missing observations and outliers) (Everitt, 2001); constructing indices; calculating summary statistics (e.g. mean, median, standard deviation or variance) (Chatfield, 1995); calculating bi-variated analysis and plotting graphs (Tukey, 1977). The aim is to clarify the structure of the data and assuring its quality and suitableness for the analysis intended.

5.1.1 Testing for recording errors

The first step consisted in obtaining frequency tables for each variable included in the data sets. The objective was to check for missing values or outliers. No cases were found with significant outliers or with a significant number of missing values[22]. In addition, it was checked that all the cases in the three data sets (students', teachers' and head teachers') had the information necessary to associate students to teachers and teachers to schools.

The results of this analysis confirmed that the data sets were ready to be analysed. A next step then was to construct indices for the items measuring similar characteristics.

It is important to mention that it was acknowledged that a common practice to deal with missing values is to use simple or multiple imputation techniques. However, due to the small number of missing values and the absence of patterns in their distribution, it was decided not to impute them and to let the software eliminate them during the model construction.

5.1.2 Construction of indices

In total the items in the students', teachers' and head teachers' context questionnaires are more than 500. As it would not be practical to try to fit a model with 500 variables and because it is assumed the answers to single items reflect a lower number of latent variables, indices were created by grouping items measuring the same dimensions. Furthermore, in this way, their power and reliability were increased (Backhoff, Andrade, et al., 2006).

These indices were constructed by following the next steps:

[22] Even when in normal conditions –because of the complexity and the high number of variables contained in the data sets system used for this work– the expectancy of missing values might be thought to be high, it was predictable not to found many recording errors if it is considered that the INEE had already "cleaned" the data sets before publishing them (Backhoff, Andrade, et al., 2006).

1) Based on theoretical criteria, single items were grouped according to the specific aspect they measure.

2) Each group of items was analysed and calibrated using the Rasch analysis technique (Rasch, 1960).

3) Internal adjustment and internal consistency coefficients were obtained. Winsteps (Linacre, 2008b) was used for the two previous points.

4) The final values of the indices were standardised with a mean equal to zero and standard deviation equal to one.

The internal consistency was evaluated with the Cronbach's Coefficient Alpha (Cronbach, 1951). This coefficient assumes that the index contains homogeneous items measuring the same characteristics or dimensions and that the internal consistency can be evaluated through the correlation among all the items forming the index (Pardo & Ruiz, 2002).

The value of the Cronbach's Alpha ranges between 0 and 1. A value closer to 1 indicates stronger internal consistency. According to the literature (see Hair, Anderson, Tatham, & Black, 1999), the indices with a Cronbach's Alpha below 0.60 were discarded for being considered to have a low internal consistency.

For the internal adjustment, i.e. to evaluate to what extent the data fit the Rasch Model, the mean-square (MNSQ) fit statistic was used. The MNSQ is a Chi square statistic divided by its degrees of freedom, its expected value is 1.00 and it ranges form 0 to infinity. Values below 1.0 indicate that the data is too predictable (i.e. over-fit the model) and values above 1.0 indicate the data is too unpredictable (i.e. under-fit the model) (Linacre, 2008a). Following to the common practices in the area (Bond & Fox, 2001; Wright & Linacre, 1994), the variables with a MNSQ out of the range 0.8 – 1.2 were eliminated.

The next table show the indices selected for the students', teachers' and head-teachers' questionnaires (after testing their internal consistency) and a brief description of the items selected for each of them (after evaluating their internal

adjustment). Their measures in the Rash scale, the full list of items forming them, their level of internal adjustment and the internal consistency coefficient can be found in the Annex C.

Table 12. Indices constructed for the students' context questionnaire

Index	Aspect measured
Conflicts at home	Frequency and length of conflicts at home.
Family's cultural capital	Cultural activities, parents' educational expectations for students, parents' level of education and number of books at home.
Family's economic capital	Goods and services present in the students' household.
School homework	Homework and study habits. Amount of time spent studying and doing homework at home.
Use of an indigenous language	Mother tongue, language used at home and language used at school.
Risky behaviour	Alcohol and tobacco consumption patterns.
Work out of home[23]	Amount of time spent in activities related to job out of the household.

Table 13. Indices constructed for the teacher's context questionnaire

Index	Aspect measured
Classroom conditions	Physical conditions and equipment available in classrooms.
Economic capital	Goods and services present in the teachers' household.
Laboral satisfaction	Level of agreement / satisfaction with relationships and other academic and physical aspects in the school.
Risky climate in the neighbourhood	Alcohol and drugs consumption in the neighbourhood.
Communication and Trust	Teachers' perceptions about communication and trust among staff.
Academic situation and support	Teachers' perceptions about academic expectations for students, support from colleagues and agreement among staff.
School equipment	Existence and condition of goods, materials and equipment available in school.
Use of educational resources	Availability and frequency of use of different educative resources.
Violence in school and neighbourhood	Happening of robbery, physical and verbal aggressions, and presence of weapons in the school and neighbourhood.

[23] For the items measuring the amount of time students spend in working related activities a summative index was built instead of using the Rasch Model, as it is assumed that the more the hours a student spends in such activities decreases the amount of time he/she is able to spend in school related activities. Therefore, there are no Rasch Measures or Internal Adjustment coefficients for those items.

Table 14. Indices constructed for the head-teachers' context questionnaire

Index	Aspect measured
Administrative controls	Tracking of academic outcomes, school calendar, timetables, and teachers' attendance and punctuality.
Consultancy given by head teacher	Consultancy given by head-teachers.
Curricular materials *(telesec.)*	Existence, condition and frequency of use of curricular materials in telesecundarias.
Administrative planning	Efficiency of the school project and existence of internal administrative organs and regulations.
Economic capital	Goods and services present in the head-teachers' household.
Infrastructure	Existence and condition of materials, equipment and buildings in the school.
Infrastructure (*telesec.)*	Existence and condition of materials, equipment and buildings for telesecundarias.
Laboral satisfaction	Level of agreement / satisfaction with relationships and with other academic and physical aspects in the school.
Parents level of involvement	Parents' participation in school activities.
School climate	Head-teachers' perceptions about support, trust, motivation, friendship, team work, agreements and conflicts among staff in the school.
Training	Training taken by head-teachers in pedagogy, administration, supervision, management, evaluation, human relationships and communications.

5.1.3 Clarifying the structure of the data

In order to have a better idea of the structure of the data, summary statistics were calculated for every variable to be included in the analysis. Also, to have an estimation of the way each independent variable is related to the dependent variables, a regression analysis was carried out for each pair of variables. The independent variables were standardised before carrying out the regression analyses.

The following tables then show to what extent the variation in the students' attainment can be attributed to each variable on its own (R^2), and the estimated effect of each variable over the students' attainment (B).

The variables are divided into two main blocks: student and school variables. Within these blocks, the variables are grouped according to the conceptually related theoretical groups described above.

Table 15. Regression analysis between Language and Mathematics scores and the demographic variables at the student level.

Variable name	Esp		Mat	
	R^2	B	R^2	B
gender	0.01	23.74	0.00	-4.37
extra_age	0.04	-59.73	0.03	-54.33
indigenous_language	0.02	-14.94	0.01	-09.09

Table 16. Regression analysis between Language and Mathematics scores and the family economic and cultural variables at the student level.

Variable name	Esp		Mat	
	R^2	B	R^2	B
socioeconomic_capital	0.17	42.20	0.09	31.26
oportunidades	0.05	-48.11	0.02	-28.63
work_out_home	0.07	-26.89	0.02	-13.75
s_educational_aspirations	0.20	45.34	0.10	32.90
reading	0.05	22.54	0.03	17.06
homework	0.02	14.18	0.01	11.29

Table 17. Regression analysis between Language and Mathematics scores and the family structure variables at the student level.

Variable name	Esp		Mat	
	R^2	B	R^2	B
both_parents	0.00	-5.80	0.00	5.07
academic_control	0.00	4.39	0.00	1.99
personal_control	0.05	23.64	0.02	15.78
p_educational_asp	0.14	38.11	0.07	26.89
risky_behaviour	0.00	7.19	0.00	5.53
conflicts_at_home	0.00	1.48	0.00	-1.93

Table 18. Regression analysis between Language and Mathematics scores and the variables measuring opportunities to learn at the student level.

Variable name	Esp		Mat	
	R^2	B	R^2	B
students_absences	0.00	4.67	0.00	1.67
teacher_absences	0.02	-13.56	0.02	-13.39
school_books	0.01	26.01	0.01	21.17
housework	0.00	0.66	0.00	-2.25
bully	0.00	-20.37	0.00	-10.42

Table 19. Regression analysis between Language and Mathematics scores and the school composition variables.

Variable name	Esp		Mat	
	R^2	B	R^2	B
s_s_extra_age	0.08	-29.13	0.05	-23.50
s_s_indigenous_language	0.03	-23.37	0.01	-14.76
s_type_of_school	n/a	n/a	n/a	n/a
s_s_work_out_home	0.13	-88.34	0.06	-63.28
s_s_socioeconomic_capital	0.22	81.54	0.13	46.59
s_t_economic_capital	0.05	28.90	0.03	22.71
s_s_educational_aspirations	0.21	46.80	0.12	36.01
s_p_educational_aspirations	0.20	45.34	0.10	32.90
s_s_risky_behaviour	0.05	60.34	0.03	45.19

Table 20. Regression analysis between Language and Mathematics scores and the school resources variables.

Variable name	Esp		Mat	
	R^2	B	R^2	B
s_t_classroom_conditions	0.07	32.53	0.06	29.86
s_t_school_equipment	0.12	41.91	0.09	35.58
s_h_infrastructure	0.09	32.96	0.05	24.65
s_t_level_of_studies	0.00	6.75	0.00	5.62
s_t_years_as_teacher	0.00	5.62	0.00	2.17
s_t_years_same_school	0.01	9.75	0.00	6.79
s_t_PCM	0.01	-7.42	0.00	-5.23
s_t_other_job	0.02	13.22	0.01	9.49
s_t_trainning	0.00	5.92	0.00	6.14
s_h_level_of_studies	0.00	1.43	0.00	1.04
s_h_years_as_headteacher	0.01	8.24	0.00	6.71
s_h_years_same_school	0.01	8.63	0.01	7.70
s_h_PCM	0.01	-23.91	0.01	-21.07
s_h_other_job	0.00	13.70	0.00	11.55
s_h_trainning	0.01	12.68	0.01	8.17

Table 21. Regression analysis between Language and Mathematics scores and the school climate variables.

Variable name	Esp		Mat	
	R^2	B	R^2	B
s_t_laboral_satisfaction	0.06	31.51	0.05	28.40
s_t_comm_trust	0.02	17.21	0.02	17.52
s_t_supp_agree_expec	0.04	25.07	0.03	23.57
s_h_laboral_satisfaction	0.01	-13.54	0.00	-12.18
s_h_school_climate	0.16	39.77	0.04	18.75
s_t_risky_neighbourhood	0.01	-12.44	0.01	-11.63
s_s_risky_behaviour	0.05	60.34	0.03	45.19
s_h_parents_involvement	0.00	6.11	0.00	5.81
school_size	0.00	5.65	0.00	1.94

Table 22. Regression analysis between Language and Mathematics scores and the school management variables.

Variable name	Esp		Mat	
	R^2	B	R^2	B
s_h_admin_controls	0.00	5.81	0.00	4.15
s_h_admin_planning	0.02	14.52	0.02	13.54
s_h_consultancy	0.00	2.07	0.00	0.94

Table 23. Regression analysis between Language and Mathematics scores and the variables measuring opportunities to learn at the school level.

Variable name	Esp		Mat	
	R^2	B	R^2	B
s_t_educative_resources	0.05	32.26	0.03	24.35
s_t_time_preparation	0.00	2.63	0.00	3.57
s_t_work_plan	0.00	3.93	0.00	2.26
s_t_homework_feedback	0.01	11.62	0.01	10.04
s_t_teacher_absent	0.01	-9.56	0.01	-8.58

As it can be seen from the tables above, many of the single variables analysed cannot explain much of the variation in the students' scores in the tests (R^2) and their effects on the dependent variables (B) are rather small. This can anticipate that many of these variables will not be reporting significant effects on the core analyses.

For both tests, the school aggregated measure of the socioeconomic capital represents the variable with the highest coefficient of determination (R^2 = 0.22 for Language and 0.13 for Mathematics) which means that 20 percent (or 13%) of the variation in the students' scores in the test can be explained by it. Other variables reporting high coefficients of determination, in order of importance, are the school average of students' educational aspirations, the individual student's educational aspirations, the aggregated measure of the parents' educational aspirations for their children and the individual socioeconomic capital.

Regarding the effect of the independent over the dependent variables, for the Language test, the variables with highest coefficients are the school aggregated measures of socioeconomic capital, risky behaviour, students' educational aspirations; the individual student's educational aspirations and the school

average of the parents' educational aspirations for their children. So, for example aggregated measure of socioeconomic capital reported a B = 81.54, which means that for every standard deviation the school's socioeconomic composition is over the average, their students expect an increase of 81.54 points in their Language tests.

For the Mathematics test, the independent variables reporting the highest effects on the dependent variables are: the aggregated measures of the socioeconomic capital, the risky behaviour, the students' educational aspirations, the school equipment; and the individual student's educational aspirations.

It is important to remember that this is a bi-variated analysis in which results are not controlled by any characteristics of the sample and that its only objective is to clarify the structure of the data.

5.2 Core Data Analysis

Drawing on the conclusions presented in the literature review and methodology chapters, the analysis presented in this section provides the information needed to reach the secondary objectives set for this work. As mentioned before, apart from the development of a Realist Methodology for SER, this research is also concerned with identifying, theoretically justifying, and testing the variables and inequity patterns of lower-secondary education in Mexico.

These variables and inequity patterns have been identified through the literature review, and their inclusion in this analysis has been theoretically justified in the sections above. This section then is focused on empirically testing the relationship between the independent and dependent variables in the EXCALE data set 2005; then, contextual-based robust data patterns will be established through the Close Replication and Constructive Replication phases.

Considering the structure of the educational data and the kind of analysis intended, it is now generally accepted that the most satisfactory approach is the

multilevel analysis technique (Aitkin & Longfort, 1986). Different features of the multilevel models will be used to answer each of the research questions of this thesis.

In comparison with the traditional multiple regression techniques used by the first SER works (e.g. James S. Coleman, 1966; Jencks, et al., 1972), the development of multilevel models represented considerable improvements in the quality of the findings by recognising the nested structure of the data in the statistical model. Nevertheless, it is important to point out that even though these are the best available techniques, they still have important limitations to be acknowledged. For example, it is has to be noted that this kind of statistical analyses cannot produce causal explanations; for that, it would be necessary to do experimental manipulations where individuals, treatments and institutions could be randomly combined! (Goldstein, 1987:372). Moreover, apart from recognising the nested structure of the data, further conditions have been identified as necessary in order to produce satisfactory inferences. According to Goldstein, it is also necessary to have a longitudinal design, "so that pre-existing student differences and subsequent contingent events among institutions can be taken into account" (Goldstein, 1987:376).

These longitudinal designs have become very popular in recent times in the field of educational quality assessment, and one of the main reasons is that they make it possible to measure the *value added* by schools. The *value added* can be defined as the difference between the expected and the actual performance of a student when considering his/her social, cultural and economic family context (Peña-Suarez, Fernandez-Alonso, & Muñiz-Fernandez, 2009). The importance of the value added approach is undeniable if it is considered that it can favour the production of fairer school league tables[24] or more precise measurement effect sizes.

This is precisely one of the main methodological limitations of this work. The data used for the analysis has not a longitudinal nature[25], no measures of

[24] Though, it is acknowledged that when the value added approach is not applied in a rigorous fashion, it could lead to the production of misleading information (see for example Shepherd, 2008).
[25] Because of different technical reasons, the datasets produced annually by the INEE are not comparable to each other (Martinez Rizo, 2003).

previous attainment are available, and therefore no value added calculations can be made. However, the main objectives of this work are not concerned with measuring the value added by particular schools (i.e. their effectiveness), nor with exact measurements of school or context effect sizes. This thesis claims its originality in the development, application and an assessment of the viability of a Realist method of science to the field of school effectiveness research. Furthermore, even if measures of prior achievement were available, it is clear that such scores will always be contaminated by socio-economic processes earlier in a child's school career so that they are never a 'pure' measure of value added. Moreover, as Coleman noted in High School and Beyond (Coleman, 1986) that such measures will not take into account changes in individuals and that at secondary school age pupils are likely to be more volatile in their personal psychology and hence again the measure of school value added is likely to be contaminated. Finally, some account of the possible biases derived from not controlling for prior achievement is taken through the close replication phase of the data analysis.

Another point to consider is that, precisely because the main objective of this analysis is different from those commonly adopted by other works using multilevel modelling techniques (i.e. identifying school effectiveness factors or getting exact measures of them), the way in which the results are presented differs from the format adopted in most cases. Since the main objective of this analysis is concerned with postulating theoretical models to explain the inequity patterns of the Mexican education system, the presentation of its results is organised according to the conceptually related theoretical groups used before. Furthermore, the interpretation of the results focuses on the extent to which the empirical results concur with the theoretical justification for the inclusion of each group of variables in the final model; and not, for example, in the size of the effects or in the percentage of the variance of the dependent variable that can be explained by the model.

In the next section I will explain, in formal terms, the specific models to be used to answer each research question. The analysis presented in this section was carried out using MLwiN (Rasbash, Charlton, Browne, Healy, & Cameron, 2009), which is a computer program designed to fit multilevel statistical models

(Aitkin & Longfort, 1986; A. Bryk & Raudensbush, 1992; Goldstein, 1987). The formal expression of the multilevel model is based on the notation proposed by Steele (2008).

5.2.1 What percentage of the variation in the educational achievement is due to differences between states, schools and students?

To answer the first question, the analysis starts with the simplest multilevel model, a linear regression which takes into consideration the nested structure of the data without including any independent variables or predictors. This model will allow us to know the maximum percentage of the variance in the students' attainment that can be explained by the state, the school and the student characteristics. In other words, the variance will be partitioned in three levels: state, school and student, where the variance assigned to each level corresponds to the maximum percentage of explanation that can be attributed to its characteristics[26]. This model is known as "null" or "empty" and may be written as follows.

$$y_{ijk} = \beta_0 + v_k + u_{jk} + e_{ijk}$$

where:

y_{ijk} is the score in the Mathematics or Language test obtained by the student *i*, in the school *j*, in the state *k*

β_0 is the estimated average score obtained by students in either test. Also known as the great mean or the intercept

[26] Even though none of the state level available variables proved to be significant in the subsequent steps on the analysis, it was decided to present a three level "empty" model in order to not to inflate the estimated maximum percentage of the variance in the students' attainment explained by the school. That is, to avoid the state effect to be assigned to the school level.

v_k is the deviation of the average score in the state *k* from the average score across states or the great mean. Also known as the residual at the state level

u_{jk} is the deviation of the average score in the school *j* from the average score in the state *k.* Also known as the residual at the school level

e_{ijk} is the deviation of the score obtained by the student *i* from the average score of the school *j* in the state *k.* Also known as the residual at the student level

v_k, u_{jk}, e_{ijk} are random coefficients, not correlated, normally distributed with mean = 0 and which variances (δ^2_v, δ^2_u, δ^2_e) will be estimated

The multilevel structure of the data is taken into account by allowing the intercept (β_0) to vary randomly across states and schools. This is why, in contrast to an ordinary liner regression, this model includes two extra terms (v_k and u_{jk}) denoting the residuals at the state and school levels, and it is also what gives the *multilevel* character to the regression model presented here.

In this fashion, it is assumed that the score of each student can be predicted by the great mean of the scores for the whole sample (β_0), plus the residual at the state level (v_k), plus the residual at the school level (u_{jk}), plus the residual at the student level (e_{ijk}). It has to be noticed that in this equation the estimated error in the regression is composed by the sum of the residuals of the three levels considered. So, the total variance in the students' scores can be expressed as:

$$\text{Var}(y_{ijk}) = \delta^2_v + \delta^2_u + \delta^2_e$$

This allows us to estimate the variance partition coefficient (VPC) for each level; in other words, the percentage of the variance in attainment that can be

attributed to differences between states ($\hat{\sigma}^2_v$), schools ($\hat{\sigma}^2_u$) or students ($\hat{\sigma}^2_e$). In this way:

$$\hat{\sigma}^2_v = \delta^2_v / (\delta^2_v + \delta^2_u + \delta^2_e)$$

$$\hat{\sigma}^2_u = \delta^2_u / (\delta^2_v + \delta^2_u + \delta^2_e)$$

$$\hat{\sigma}^2_e = \delta^2_e / (\delta^2_v + \delta^2_u + \delta^2_e)$$

According to this, the next table presents the variance partition coefficients (VPCs) for each level.

Table 24. Language and Mathematics VPCs for each level of analysis

Level	Language	Mathematics
State	5.22	11.509
School	31.96	16.093
Student	62.81	72.398
Total	100	100

Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 1%

The table above shows that there are significant differences between the states regarding the average score of their students in both subjects. The differences are considerably smaller than those between schools and they are more pronounced in Mathematics (11.5%) than in Language (5%).

It can also be observed that 32% of the total variance in the students' attainment in Language can be attributed to the differences between schools, that is, to the variation in the schools' scores averages. Therefore, it can be said that there are significative differences between schools regarding the average score reached by their students in the Language test. Similar differences are shown for the Mathematics scores, though they only amount for the 16% of the total variance.

Finally, the differences between students are also more marked in Mathematics (72%) than in Language (63%), showing that students from a same school tend to obtain less homogeneous scores in the first than in the second. The larger coefficients for the student level also demonstrate that even there important differences between schools, the most important ones happen within them.

It is important to note that the calculations above do not account for previous achievement measures or for any other controlling variables. So, even when the VPCs could seem auspicious for the potential of Mexican schools for improving the educational outcomes of their students, it has to be taken into account that a considerable amount of these variances might depend on the characteristics of the intake and the context in which schools are inserted and not on what schools actually do (Cf. Blanco, 2008a; Cervini, 2009; Steele, 2008).

The next analytical question is:

5.2.2 What characteristics of each level (i.e. schools, and students) have a significant effect on educational achievements?

To answer this question, the previous model was extended by adding the hypothesised explanatory variables at the school and the student levels. This is then a two level model with fixed effects and random intercept. In order to make simpler the explanation of the model, it is assumed that only two explanatory variables are included to the model, *students' educational aspirations* (x_1), at the student level; and the *socioeconomic composition of the school* (x_2), at the school level. Thus, the model can be formally expressed as follows:

$$y_{ij} = \beta_{0j} + \beta_1 x_{1ij} + \beta_2 x_{2j} + e_{ij}$$
$$\beta_{0j} = \beta_0 + u_{0j}$$

where:

y_{ij} is the score in the Mathematics or Language test obtained by the student *i*, in the school *j*

β_{0j} is the estimated average score obtained by students in either test. Also known as the great mean or the intercept. The addition of the subscript *j* indicates that the intercept is allowed to vary randomly across schools and, therefore has a residual associated (U_{0j}).

β_1 is the estimated effect of the variable x_1 (*students' educational aspirations*) over *y* (the score in the Mathematics or Language test).

x_{1ij} is the value of the variable *students' educational aspirations* for the student *i* in the school *j*.

β_2 is the estimated effect of the variable x_2 (*school socioeconomic composition*) over *y* (the score in the Mathematics or Language test).

X_{2j} is the value of the variable *school socioeconomic composition* for the school *j*.

U_{0j} is the deviation of the average score in the school *j* from the average score across schools or the great mean. Also known as the residual at the school level. The subscript *0* indicates that the residual associated to the intercept (which is also marked with a subscript *0*).

e_{ij} is the deviation of the score obtained by the student *i* from the average score in the school *j.* Also known as the residual at the student level

$u_{j,}$ e_{ij} are random coefficients, not correlated, normally distributed with mean = 0 and which variances (δ^2_u, δ^2_e) will be estimated

The reason for this model having a random intercept is that the fitted regression line for the school *j* will differ from the overall schools' average line in its intercept, by an amount equivalent to U_{0j}. However, the slope of the school line is assumed to be fixed at *β*, i.e. the effect of socioeconomic_capital and school_size is assumed to be the same for all schools.

Summarising, it is assumed that the score of each student can be predicted by the great mean of the scores for the whole sample (β_0), plus the residual at the school level (u_k), plus the estimated effect of the socioeconomic_capital multiplied by the value of this variable for the student *i* in the school *j*, plus the estimated effect of the school_size multiplied by the value of this variable for the school *j*, plus the residual at the student level (e_{ijk}).

The next analytical question is:

5.2.3 Do the effects of the individual explanatory factors remain constant across different socio-economic and cultural contexts?

So far, the model described only considers the main effects of the variables hypothesised to have an influence in the students' scores (*y*). However, in practice, the relationship between *y* and the explanatory variables (*x*) may depend on the value of other explanatory variables (Steele, 2008), i.e. interaction effects between x_1 and x_2, for example. In a multilevel model x_1 and x_2 may be at the same or at different levels, when the hypothesised interaction is between variables at different levels it is referred to as a cross-level interaction. Because the third research question refers to the possible interaction effects between the socioeconomic composition of the schools and the individual effects, before presenting the results to answer questions 2 and 3, a model including the interaction effects is explained.

To illustrate cross-level interactions and their interpretation, an interaction between school socioeconomic composition and students' educational

aspirations is added to the previous model. The formal expression of such a model can be as follows:

$$y_{ij} = \beta_{0j} + \beta_1 x_{1ij} + \beta_2 x_{2j} + \beta_3 (x_{2j}) (x_{1ij}) + e_{ij}$$
$$\beta_{0j} = \beta_0 + u_{0j}$$

where:

y_{ij} is the score in the Mathematics or Language test obtained by the student *i*, in the school *j*

β_{0j} is the estimated average score obtained by students in either test. Also known as the great mean or the intercept. The addition of the subscript *j* indicates that the intercept is allowed to vary randomly across schools and, therefore has a residual associated (U_{0j}).

β_1 is the estimated effect of the variable x_1 (*students' educational aspirations*) over *y* (the score in the Mathematics or Language test).

x_{1ij} is the value of the variable *students' educational aspirations* for the student *i* in the school *j*.

β_2 is the estimated effect of the variable x_2 (*school socioeconomic composition*) over *y* (the score in the Mathematics or Language test).

X_{2j} is the value of the variable *school socioeconomic composition* for the school *j*.

β_3 is the estimated effect of the interaction between the variable x_2 (*school socioeconomic composition*) and the variable x_1 (students' educational aspirations) over *y* (the score in the Mathematics or Language test)

U_{0j} is the deviation of the average score in the school *j* from the average score across schools or the great mean. Also known as the residual at the school level. The subscript *0* indicates that the residual associated to the intercept (which is also marked with a subscript *0*).

e_{ij} is the deviation of the score obtained by the student *i* from the average score in the school *j.* Also known as the residual at the student level

u_j, e_{ij} are random coefficients, not correlated, normally distributed with mean = 0 and which variances (δ^2_u, δ^2_e) will be estimated

In this fashion, a significant and positive β_3 coefficient would mean –*ceteris paribus*– that the positive effect of the individual educational aspirations on the students' attainment is stronger as the schools' socioeconomic composition is higher. In other words, it can be said that the effect of the school socioeconomic composition is stronger as the students' individual educational aspirations are higher.

Conversely, a significant and negative β_3 coefficient would mean –*ceteris paribus*– that the positive effect of the individual educational aspirations on the students' attainment weakens as the school socioeconomic composition is higher. In other words, it can be said that the effect of the school socioeconomic composition weakens as the educational aspirations are higher.

In this way the significant coefficients for the interactions between the school composition and the individual explanatory variables would be the main results to address the third research question.

The next tables show the results of the multilevel model fitted to answer the research questions 2 and 3, i.e. to explore the relationship between the students' attainment and the hypothesised explanatory variables. The presentation of the results is organised according to the conceptually related theoretical groups used in the sections above; however, the coefficients presented in each table do not correspond to a model including only the variables presented in each table but to the final model. The strategy followed to define the final model was an adaptation of the so-called backward strategy as, according to Twisk (2006), in the literature on multilevel modelling it is argued to be the preferred method. So, the construction of the final model followed the next steps: i) starting from the empty model, the independent variables of the first conceptually related theoretical group were added to the model, ii) the variables of the first group showing non-significant coefficients ($p<0.05$) were removed from the model and the variables of the second group were added and so on, iii) once the variables of all groups were tested, -one by one- each of the variables originally removed were added and removed again if they showed non-significant coefficients, iv) the procedure continued until all the variables in the model showed to be significant[27]. This strategy was followed for the two independent variables (i.e. Language and Mathematics scores).

Table 25. Regression coefficients for the demographic variables. Student level.

	Language		Mathematics	
Variable name	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
Gender+	n.s.	n.s.	-20.834	0.916
extra_age++	-3.651	1.611	-15.983	1.600
indigenous_language	-4.707	0.719	n.s.	n.s.
s_s_socioeconomic_capital **X** gender	3.623	1.140	n.s.	n.s.
s_s_socioeconomic_capital **X** indigenous_language	-1.731	0.538	n.s.	n.s.

+ reference category = male
++ reference category = no
Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

[27] The modelling strategy also included testing for random variance components for the independent variables, however the specific procedure for this step and the results are explained latter as they produced the information to answer the fourth research question.

As it can be seen in the table above, for the Mexican students in the third year of the lower-secondary education, being older than their peers has a negative and significant influence on their attainment in both, the Language and the Mathematics tests, being the effect clearly stronger for the Mathematics results. If it is considered that the main reasons for a student to be older than their peers is a temporary drop out from the education system or the repetition of a school year, these results show an empirical pattern on the negative relationship between educational lag and student attainment[28].

Being a girl does not report significant effects for Language, but it does show important negative effects over the students' scores in Mathematics. Unfortunately, the data available does not provide elements to explore possible reasons behind these results (e.g. gender differences in academic self-concept, motivation towards specific subjects or learning styles).

Conversely, belonging to an indigenous group does not show significant effects on the Mathematics results, but it does on the Mathematics attainment. The last result seems logical if in considering whether a student is indigenous is his or her usage of an indigenous language in different contexts (e.g. at home, at school, among peers, etc.). So, for a given student (ceteris paribus), for every standard deviation his or her indigenous language index is over the mean, he or she is expected to obtain almost five points less than the average student.

Regarding the interaction effects between the socioeconomic composition of the schools and demographic variables, significant effects were found only for the Language scores for the gender and indigenous language variables. In the first case, it can be said that the effect of being a girl over the Language attainment is stronger as the school socioeconomic composition is higher. In other words, this means that schools with higher socioeconomic composition favour the girls' attainment in Language.

In the same way, it can be said that the negative effect of a high usage of an indigenous language over the Language scores is stronger as the level of the

[28] According to the methodology proposed in this work, a comparison between the results of this model and other works will be done in the following phases of the analysis.

socioeconomic composition of the school increases. This result is interesting as it suggests that the performance of indigenous children is undermined in contexts of high socioeconomic school composition. In other words, that the supposed positive peer effects from spending time in a context characterised by high levels of embodied cultural capital, for the indigenous children, is actually a negative one.

Thus result, then, provides evidence to refute the hypothesis that, for children who do not normally speak Spanish in their day to day life –and thus have a disadvantage in the Language related school subjects– spending time with children with a high socioeconomic capital has positive effects on their Language attainment.

In this case it is clear the existence of underlying mechanisms that condition or influence the way in which schools with different socioeconomic compositions receive and treat indigenous students. These unobservable mechanisms could be related, for example, to dynamics of ethnic discrimination.

The next phase of the analysis will explore further this kind of findings by testing for significant differences across schools regarding the way in which this kind of unobservable mechanism influences the students' educational attainment.

Table 26. Regression coefficients for the family economic and cultural variables. Student level.

	Language		Mathematics	
Variable name	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
socioeconomic_capital	n.s.	n.s.	n.s.	n.s.
oportunidades[+]	-2.456	1.110	3.844	1.096
work_out_home	-13.885	0.508	-4.750	0.507
s_educational_aspirations	19.330	0.694	15.16	0.537
reading	13.170	0.458	9.913	0.447
homework	5.395	0.500	6.141	0.486
s_s_socioeconomic_capital **X** socioeconomic_capital	1.807	0.767	n.s.	n.s.
s_s_socioeconomic_capital **X** oportunidades	7.347	1.483	7.459	1.431

s_s_socioeconomic_capital **X** work_out_home	-1.658	0.577	-1.628	0.554
s_s_socioeconomic_capital **X** student_educational_asp	3.813	0.873	3.913	0.687
s_s_socioeconomic_capital **X** reading	2.294	0.555	3.646	0.548

+ reference category = no
Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

From the six variables included in this group, five of them show significant effects on the Language and the Mathematics scores: oportunidades, work out of home, students' educational aspirations, reading and homework. It could be somehow surprising not to find significant coefficients for the individual socioeconomic capital, however, as it has been shown, the importance of the effect of this variable becomes more evident when it is aggregated to the school level.

Furthermore, at the individual level, the remaining variables seem to explain better the effect of the economic and cultural characteristics of the students families. For example, the amount of time students spend doing a remunerated activity out of home is undoubtedly a good indicator; on the one hand, of the economic need of his or her family and; in the other, of the amount of time they dispose of for study related activities. In that sense, the negative and significant coefficients showed by these variables for Language and Mathematics attainment support the hypothesis that economic capital is positively correlated to student attainment.

Regarding Oportunidades, before interpreting its coefficients, it is important to remember that it is a public policy programme implemented by the Mexican government whose main objective is to improve the living conditions of the families experiencing extreme poverty. For doing that, Oportunidades focuses on three areas: nutrition, health services and education; and one of its main strategies consists in cash transfers conditioned to: parents' attendance to talks about nutrition and health issues, regular medical check-ups for the family members and regular attendance of children to school. This is important to mention because, even though it is evident that oportunidades can be taken as a proxy measure for the economic situation of the students' families, it also

involves other social dynamics that may provide some elements to interpret the coefficients in the table above.

That is, the fact that a child is beneficiary of the Oportunidades programme is equivalent to say that he or she lives in extreme poverty (i.e. this the main requisite for receiving support from this programme), and therefore a poor school performance would be expected for him or her. This is the case for the Language score (i.e. a significant and negative coefficient), however for Mathematics the opposite situation applies (i.e. a significant and positive coefficient).

It may be then, that Oportunidades is not only bringing disadvantaged children to school, but also contributing to modifying the bases on which their families make rational decisions about the educational trajectories of their members. To support this claim, the results of a recent work developed by Torres Cervantes (2009) will be useful. By applying in-depth interviews to a sample of Mazahua[29] girls and their families in the Mexican Municipality of Atlacomulco in the State of Mexico, Torres Cervantes explored the way in which Oportunidades affects the educational decisions of the subjects regarding the educational trajectories of their members. As it has been previously said, Oportunidades is a public policy programme designed to target poverty by providing cash transfers to families in exchange for their compliance with program requirements, such as children's regular school attendance and ensuring preventative healthcare and nutritional support for the whole family. Torres Cervantes' results point two different paths: the first one has to do with the cash payments themselves and the second to the time parents spent (because of the activities they get involved in order to comply with the program requirements) with families from higher socioeconomic and cultural contexts.

[29] The Mazahua is an indigenous group, principally inhabiting the north-western portion of the State of Mexico and north-eastern area of Michoacán State. According to the last census carried out by the National Institute for Statistics, Geography and Informatics (II Conteo Intercensal de Población y Vivienda, INEGI 2005), Mazahua speakers numbered 95,411. The economy of the Mazahua communities is mainly based on the agriculture of maize and is complemented by the production of wooden handicrafts. Immigration, as with many indigenous groups, is also an important source of income for the Mazahua families.

Regarding the cash transfers, Torres Cervantes claims that this extra money contributes in an important way towards both the direct and indirect costs of education. On the one hand, the extra money in the family budget would make it possible to buy goods and services necessary for the children's education and otherwise inaccessible such as public transportation, school uniforms, stationary and books, etc. (direct costs of education). On the other hand, these cash transfers would allow families to dispense with the income coming from child labour, and thus having their children in school instead of working (indirect costs of education).

The second path refers to the activities in which the family members get involved in order to receive the cash transfers, for example, children attending regularly to school and parents to talks about nutrition and health. In this respect, Torres Cervantes observed that through the time spent with families from higher socioeconomic and cultural contexts, the beneficiaries of Oportunidades increased the value they assigned to education as a vehicle for social mobility.

In short, the results of Torres Cervantes' study point to the possibility that Oportunidades modifies, in a positive way, the perception of its beneficiaries regarding the pertinence and feasibility of keeping their family members in the education system for longer. In turn, this would be expressed in the form of higher educational aspirations, which in turn would have a positive effect on the students' educational attainment. It has to be noted that in the construction of an argument like the one described above, there are at least three consecutive-interconnected steps that would have to be empirically tested in order to validate it. In this specific case, these steps are: i) the influence of Oportunidades on the bases on which families make decisions about the educational trajectories of their members, ii) the relationship between this effect of Oportunidades and the educational aspirations expressed by the families, and iii) the relationship between educational aspirations and educational attainment. As it will be shown later in this work, when having the appropriate empirical information, the confirmation of this kind of arguments (empirical patterns) is what can be obtained by applying the strategies and methods proposed by ATOM in the educational context.

The reason the effect of Oportunidades seems to be positive only for Mathematics can be explained by the increased negative handicap that a low cultural capital environment has on the language-related subjects relative to mathematics. Arguably mathematics does not rely on the home culture in the way that language does. That is, while the students' performance in Mathematics is mostly dependant on the school activities, the students' performance in Language is highly influenced by the cultural practices at home (e.g. the use of an elaborated linguistic code in terms of Bernstein, for example). Again, these results show evidence of social mechanisms underlying the observed effects of Oportunidades over educational attainment and therefore will be the departing point for the next phase of the analysis.

The three remaining variables from this group (i.e. students' educational aspirations, reading and homework), as discussed before, are assumed to be related to the embodied cultural capital of the students' families. In other words, they are taken as expressions of quasi permanent dispositions inherited by individuals from their families or acquired through socialisation in extra-family contexts (e.g. in the school). In this fashion, as the three of them show positive and significant coefficients in both Language and Mathematics, it can be said that they provide empirical evidence to support the hypothesis that high levels of cultural capital are related to high educational performance. It is also important to point out the magnitude of the effects of these variables, specially the educational aspirations, which shows the highest coefficient among all the explanatory variables in the Language model. That is, for every standard deviation above the average of educational aspirations, -ceteris paribus- a student is expected to obtain 19 points more in the Language test.

In respect of the way in which the effect of the variables of this group is mediated by the socioeconomic composition of the schools, there were found significant interactions for all the variables but homework. In this way, the coefficients show that the positive effect of the individual socioeconomic capital on the students' language scores increases as the socioeconomic composition of the school is higher.

For the variable oportunidades, significant and positive coefficients were found for Language and Mathematics. This means that the negative influence of Oportunidades over Language weakens as the socioeconomic composition of the school increases. On the other hand, as the main effect of Oportunidades over Mathematics is positive, the positive coefficient of the interaction can be interpreted by saying that the higher the socioeconomic composition of a school, the stronger the positive effect of Oportunidades over the students' attainment. This result is interesting, because it can be interpreted as providing evidence in the sense that the Oportunidades students would be increasing their cultural capital as a result of the time they spent –in school– with peers from higher socioeconomic levels.

The interactions between the socioeconomic composition and the variable work out of home, show negative and significant coefficients for the Language and Mathematics tests. This indicates that the negative effect of working out oh home increases as the socioeconomic composition of the school is higher. This result is also important because it unveils another underlying mechanism. It was said before that the child labour can be taken as a proxy variable for the socioeconomic status of the family and/or for the time children have available for study-related activities. Now, as it has been explained before, the positive interaction between Oportunidades and the socioeconomic composition of the school suggests that schools with students from high socioeconomic strata are favourable for the educational attainment of children from low socioeconomic levels (i.e. children considered to be in extreme poverty by Oportunidades). However, if "work out of home" is taken as proxy variable for the families' socioeconomic status, the negative and significant interaction between it and the socioeconomic composition of the school suggests the opposite: schools with a high socioeconomic composition are *unfavourable* for the educational attainment of children from low socioeconomic levels.

Therefore, a possible explanation for this apparently contradictory result, could be that the variable "work out of home" works better as a proxy of the time and energy working children have available for studying, rather than an indicator of socioeconomic status. Along these lines, the interpretation of the results as a whole can be indicating that what schools with high SES intake penalise is the

lack of time to dedicate to school activities rather than the lack of cultural and economic capital.

Finally, the interactions of the socioeconomic composition of the schools and the students' aspirations and their habit of reading can also be used to support the interpretation above. That is, the positive effect of these dispositions towards education (i.e. embodied cultural capital) increases as the socioeconomic composition of the school is higher. In other words, it can be used as evidence to claim that the higher the socioeconomic composition of a school, the more it relates to the embodied cultural capital (i.e. educational aspirations and habit of reading) of its students.

Table 27. Regression coefficients for the family structure variables. Student level.

	Language		Mathematics	
Variable name	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
Both_parents+	-7.033	1.035	n.s.	n.s.
academic_control	-5.618	0.469	-6.612	0.457
personal_control	8.896	0.491	5.18	0.474
p_educational_asp	2.788	0.672	n.s.	n.s.
Risky_behaviour	4.327	0.455	3.304	0.452
conflicts_at_home	n.s.	n.s.	-2.425	0.447
s_s_socioeconomic_capital **X** academic_control	1.264	0.596	n.s.	n.s.
s_s_socioeconomic_capital **X** personal_control	1.971	0.645	2.646	0.595
s_s_socioeconomic_capital **X** parents_educational_asp	-1.865	0.832	n.s.	n.s.
s_s_socioeconomic_capital **X** conflicts at home	1.531	0.586	1.241	0.566

+ reference category = no
Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

As it can be seen in the table above, the six variables included in this group show significant direct effects over the educational attainment (both_parents only for Language and conflicts_at_home only for Mathematics).

The negative and significant coefficient of the variable measuring the presence of both parents in the Language model is an unexpected result. As according to

social capital theory, its behaviour should be exactly the opposite. It was also mentioned that more recent empirical evidence suggests that the negative effects normally related to single parenthood are rather a function of income; however, the empirical data used in this research do not support this hypothesis either (i.e. there is not a significant relationship between this variable and economic or cultural capital). Three possible explanations can be ventured for such a contradictory result, however all three are constrained by the impossibility of fairly distributing the praise and the blame in complex statistical models like the one that is being analysed here. The first possible explanation is related to probable inaccuracies in the operationalisation of the variable, the second one with a poor fit between the theory and the empirical data (i.e. the inappropriateness of applying a theory developed for a specific context to a different one), and the third one has to do with a possible spurious correlation originated from a technical deficiency of the model or a limitation of the statistical technique in itself. Any of the three options could provide a total explanation of the result in question or the three of them could explain it in a partial way. Further research would be required to clarify which of these possibilities is most likely. Actually, as it will be see later, provided that there is enough empirical information (in quantity and quality), the latter stages of ATOM can provide elements to elaborate an explanation for this kind of apparently contradictory results.

A similar situation is present in the coefficients of the variable risky_behaviour (i.e. the maximum amount of alcoholic drinks and cigarettes consumed by the students in a single day). The coefficients for Language and Mathematics are significant and positive. This is contradictory with the original hypothesis, as it was expected that a high consumption of tobacco and alcohol would be related with lower levels of attention received by the students from their parents, and therefore (according to the social capital theory) to lower educational attainment. Again, it is not possible to offer a realistic explanation, and, like in the other cases, further research is required in the topic in order to obtain elements to elaborate a coherent and consistent conclusion.

Another unexpected result is the negative and significant coefficient of the academic_control variable over the students' attainment in Language and

Mathematics. It has to be remembered that, originally the academic_control (i.e. to what extent parents check on the school activities and results of their children) and the personal_control (i.e. to what extent parents check on their children's personal affairs) had been hypothesised to be proxy measures for the time and attention parents pay to their children, and therefore for the opportunity for transmission of cultural capital or for the reinforcement of the students' self-confidence through the families' emotional support, for example. Although this seems to be the case for the "personal control" variable, parents' close attention to the children's academic activities give the impression to be perceived more as an emotional pressure or as a lack of trust. This interpretation can be especially appropriate if it is considered that we are dealing with adolescent children, for whom independence and trust are highly valuated and even necessary for their healthy psychological development (Meichenbaum, Fabiano, & Fincham, 2002).

Finally, conflicts_at_home does observe the behaviour expected according to the theory. It shows a significant and negative influence over the student attainment, but only in Mathematics. In this way, the results suggest that a family with fewer conflicts favours the inter-generational transmission of structural resources (i.e. cultural capital) and the reinforcement of students' self-confidence that, in turn, would contribute to a better academic performance.

Regarding the relationship between the variables in this group and the socioeconomic composition of the school, there were found significant interactions for the academic and personal control variables, the parents' educational aspirations for their children and for the frequency and length of conflicts at home.

For the academic control, the positive interaction can be interpreted by saying that the negative effect of this variable over the attainment in Language diminishes as the socioeconomic composition of the schools increases. Without having elements to make a more detailed analysis, this result suggests that the strategies of academic supervision used by parents are different according to their levels of cultural and economic capital. Going further, it could also be said that the kind of support parents with low levels of cultural and economic capital

can offer to their children is less effective than the one can be offered by parents from higher SES (e.g. holding higher levels of education).

The positive interaction for the “personal control” variable indicates that the positive effect of this variable over the students’ attainment in Language and Mathematics is strengthened when the school has a high socioeconomic composition. This variable also suggests the existence of different strategies to supervise or support children across different socioeconomic context (i.e. an underlying mechanism), and given that some strategies seem to be more beneficial than others for the educational results, it would be interesting to make further research on this topic.

Conversely, the parents’ educational aspiration for their children showed to have a negative and significant interaction with the socioeconomic composition of the school (only for Language). In other words, the positive effect of high educational expectations for children weakens as the families’ SES increases. This result is logical if it is considered that for children coming from families with high levels of socioeconomic capital, reaching the highest levels in the education system is somehow taken for granted, whereas for children from disadvantaged contexts this kind of goals are not expected for all and therefore represent a stronger incentive.

Finally, the interaction between the length and frequency of conflicts at home and the socioeconomic capital aggregated at the school level showed to be positive and significant. This result indicates that the negative effect of the variable conflicts_at_home decreases in more favoured socioeconomic contexts. Although it has to be noticed that the effects of the interactions of the variables of this group and the socioeconomic composition of schools is rather small in comparison with the other groups, once again, this result suggests the existence of unobservable mechanisms underlying the relationships among these variables, and further (maybe qualitative) research would be desirable in order to explain the differences in the social dynamics within the families across different socioeconomic contexts and their relation to the student attainment.

Table 28. Regression coefficients for the variables measuring opportunities to learn. Student level.

Variable name	Language		Mathematics	
	Coefficient	Standard error	Coefficient	Standard error
students_absences	1.834	0.456	n.s.	n.s.
teacher_absences	-4.213	0.451	n.s.	n.s.
school_books+	7.02	1.225	5.474	1.181
Housework	4.143	0.443	2.698	0.451
bully+	-6.431	1.257	-5.177	0.443

+ reference category = no
Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

The last group of variables is related to the physical and emotional conditions affecting the opportunities to learn. As it can be seen, al the variables considered show significant effects, though the teachers and student absences seem to be relevant only for Language.

According to the theoretical frame proposed for this group of variables, students and teacher absences and students' contribution to housework, would be proxy measures for the time students invest in school related activities. Following this logic, the teachers' and students' absences would be negatively related to attainment, and the opposite would apply for the amount of housework, as it supposes less time for studying. However, this hypothesis is only confirmed for the teachers' absences in Language (i.e. it has a negative and significant coefficient). For the other variables the coefficients are contrary to what was expected. In the case of the housework, the explanation could be that this variable is not as good as a proxy measure for the time students have available, as it is for the kind of relationship among the members of the family. That is, high levels of cooperation with the housework could be denoting compromise, responsibility and solidarity among the members of the family. In the case of the students' absences, a linear correlation between those and the socioeconomic capital of the families show a moderated positive coefficient (0.172, $p<0.01$). This might indicate that the reason students miss school days could somehow be related to the practice of other activities that could, in turn, be favouring the accumulation of cultural capital (e.g. holidays, extra-school activities). Now, it is important to remember that these attempts to provide alternative explanations to the lack of fit between theory and empirical data can only be regarded as

such (and not as final or definitive explanations[30]), because they are limited by the impossibility of distributing the praise and the blame between the theory, its operationalisation and the statistical analysis utilised.

On the other hand, the opportunities to learn represented by the availability of the relevant physical resources (i.e. school books) and safety and appropriateness of the learning environment (i.e. whether or not the students report to be victims of bullying) behaved according to the theory. That is, disposing of the books needed for the school course has a positive effect over the Language and Mathematics students' scores; and being a victim of bullying has negative effects on the students' attainment in both subjects.

Table 29. Regression coefficients for the variables measuring school composition. School level.

	Language		Mathematics	
Variable name	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
s_s_extra_age	-2.73	0.806	-3.865	0.852
s_s_indigenous_language	n.s.	n.s.	n.s.	n.s.
s_type_of_school_vocational+	n.s.	n.s.	n.s.	n.s.
s_type_of_school_tv+	10.324	2.467	23.083	2.641
s_type_of_school_private+	16.738	2.819	18.127	3.260
s_s_work_out_home	-13.868	2.031	-13.474	2.174
s_s_socioeconomic_capital	12.698	2.006	10.841	2.065
s_t_economic_capital	n.s.	n.s.	n.s.	n.s.
s_s_educational_aspirations	8.628	1.064	9.697	1.134
s_p_educational_aspirations	n.s.	n.s.	n.s.	n.s.
s_s_risky_behaviour	n.s.	n.s.	n.s.	n.s.

+ reference category = general
Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

According to the theoretical framework proposed in this work, the variables contained in this group represent the characteristics of the school composition that may have an impact on the students' attainment. That is the *institutional habitus* formed by the interaction among the demographic characteristics of the intake, a series of formal characteristics and rules belonging to the bureaucratic

[30] In accordance to the methodology proposed in this thesis, such definitive explanations can only be produces through a cyclical process including the establishment of relevant robust contextual patterns and their explanation through theoretical devices.

structure of schools, the level and composition of students' and teachers' socioeconomic status, and the aspirational environment of the school.

Regarding the demographic composition of the school, only the proportion of students with an age over the normative one presents a significant coefficient. Consistent with the theory, the results suggest that a high proportion of students older that their peers would contribute to producing an adverse institutional habitus.

The formal characteristics linked to the different bureaucratic structures of schools (i.e. type of school) also showed to have significant effects over the educational outcomes. For the interpretation of the coefficients of this variable, it is necessary to remember that they correspond to a series of four "dummy variables", one for each modality of lower-secondary education existent in Mexico[31] with the "general" schools being the category of reference. In this manner, when a school modality shows a significant coefficient it has to be interpreted in reference to the general schools. So, the results show that there are no significant differences between the effect of vocational and general schools over the students' attainment. On the other hand, the students from private schools and telesecundarias are expected to obtain higher educational scores that their peers enrolled in general schools. This could be explained by the fact that these types of schools have a lighter bureaucratic structure, private schools because they enjoy independence in their administrative and managerial decisions, and telesecundarias because they normally have a reduced number of staff (in many occasion there are only one or two teachers or tutors for the three grades, from whom one of them normally also act as head-teacher).

An alternative explanation can be, of course, that the students enrolled in private schools are the ones with the highest SES. However this does not help to explain the positive effect of the telesecundarias. Actually, the results draw attention to the fact that telesecundarias show the highest coefficient in Mathematics, as this modality is characterised by having students with the lowest levels of socioeconomic capital; however, a possible explanation for this

[31] A full explanation of the characteristic of these different modalities can be found in the Annex D.

is that, because of their light bureaucratic structure, they can adapt to the needs of their students in a quicker and more efficient way. Furthermore, the fact that the attainment in Mathematics has shown to be less influenced by the socioeconomic characteristics of the students also reinforces this argument.

These results are also interesting because they seem to provide elements to support the naturalistic view on the effects of the school size. That is that a light bureaucratic structure would favour the personalisation of the relationships, the possibility to reach consensus among staff in academic issues and the informal interaction among the members of the school. However, more detailed empirical research would be necessary in order to confirm this hypothesis.

The aggregated variables of students' socioeconomic capital and work out of home, also behave according to the theory. That is, the first proved to have a positive influence over the educational outcomes, and the second a negative one. It can be said then, that these variables contribute to the institutional habitus in a positive and negative way respectively. In turn, the teachers' economic capital showed not to have a significant relationship with the educational attainment.

Finally, concerning the aspirational environment of the school, the results show that only the school aggregated students' educational aspirations have a significant –and positive effect on the academic attainment of the students, reflected in both, Language and Mathematics scores. In other words, a high level of educational aspiration in a school contributes in a positive way to an institutional habitus that is favourable for the learning achievement of its students.

Table 30. Regression coefficients for the variables measuring school resources. School level

Variable name	Language		Mathematics	
	Coefficient	Standard error	Coefficient	Standard error
s_t_classroom_conditions	n.s.	n.s.	3.378	1.205
s_t_school_equipment	5.102	1.034	5.739	1.279
s_h_infrastructure	n.s.	n.s.	n.s.	n.s.
s_t_level_of_studies	n.s.	n.s.	n.s.	n.s.
s_t_years_as_teacher	n.s.	n.s.	n.s.	n.s.
s_t_years_same_school	n.s.	n.s.	n.s.	n.s.
s_t_PCM	n.s.	n.s.	2.623	0.792
s_t_other_job[+]	-2.214	0.716	n.s.	n.s.
s_t_trainning	1.996	0.669	n.s.	n.s.
s_h_level_of_studies	n.s.	n.s.	n.s.	n.s.
s_h_years_as_headteacher	n.s.	n.s.	n.s.	n.s.
s_h_years_same_school	n.s.	n.s.	n.s.	n.s.
s_h_PCM	n.s.	n.s.	n.s.	n.s.
s_h_other_job	n.s.	n.s.	n.s.	n.s.
s_h_trainning	n.s.	n.s.	n.s.	n.s.

+ reference category = no
Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

The results of the variables of this group confirm, in a partial way, the hypothesis set out in the theoretical framework. That is that, in contrast to the empirical evidence in the developed countries, for the Mexican case the infrastructure available in schools does have an effect on the educational outcomes. This also provides evidence to support the main critiques made to the traditional approach of SER: the findings from studies carried out in developed countries cannot be applied in countries with different contextual characteristics. In this case, the positive and significant coefficients of the physical conditions of classrooms (for Mathematics) and the availability of school equipment (for both subjects) show that the infrastructure has an important role in explaining the differences in students' attainment. As was suggested before, it may have to do with the fact that the infrastructural conditions of schools are generally much more homogeneous in developed than developing countries. In this way, the positive coefficient of these variables can be used as evidence to show the relevance of exploring the mechanisms through which this occurs. Two, non exclusive, possible mechanisms can be taken as a point of departure: on the one hand, it may be that the time invested by the school staff trying to get an adequate infrastructure for their schools

distracts them from their substantive activities; and on the other hand, it might be that the inadequacy of the physical spaces plays against the motivation of students and their construction of a positive school experience and collective identity.

Regarding the characteristics of the human resources available in schools, it is surprising that none of the head-teachers' characteristics showed a significant effect on the educational attainment. One possible explanation for that could be that most of these variables seem to be operationalised from the rational perspective on organisations[32], in other words they are focused on structural aspects rather than in the relations among actors or the relationship of the schools with their environment. If this the case, on the one hand, the empirical data may not represent a useful mean of describing the formal and informal mechanisms operating in schools; and in the other, it might be that the centralisation and inflexibility that characterises the higher levels of the formal structure of the Mexican educational system does not allow for much variety among the characteristics of the head-teachers.

Among the five dimensions included in this group (i.e. cultural capital / level of studies, training, experience, work stability and availability of time / dedication), only the participation of teachers in training activities and the amount of time at their disposal for professional activities contribute in a significant way to explain the students' differences in attainment, though not in a very consistent way. That is the variables used as proxies to measure the training levels of the teachers show significant and positive coefficients only for one subject each, participation in the Programa de Carrera Magisterial for Mathematics, and the number of courses taken in the last two years for Language. In turn, whether the teachers carry out another paid job apart from their work in the school has a negative and significant effect only for Language. As it was said before, although in a partial way, these results provide evidence to support the hypothesis set out in the theoretical framework: higher levels of training and a greater amount of time to spend by teachers in school activities have a positive effect on the educational attainment of their students.

[32] To review the variables forming the indices in this group, see the "construction of indices" section of this chapter.

Table 31. Regression coefficients for the variables measuring school climate. School level.

	Language		Mathematics	
Variable name	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
s_t_laboral_satisfaction	n.s.	n.s.	n.s.	n.s.
s_t_comm_trust	n.s.	n.s.	n.s.	n.s.
s_t_supp_agree_expec	n.s.	n.s.	n.s.	n.s.
s_h_laboral_satisfaction	n.s.	n.s.	n.s.	n.s.
s_h_school_climate	n.s.	n.s.	n.s.	n.s.
s_t_risky_neighbourhood	n.s.	n.s.	n.s.	n.s.
s_s_risky_behaviour	n.s.	n.s.	n.s.	n.s.
s_h_parents_involvement	1.466	0.672	n.s.	n.s.
school_size	n.s.	n.s.	n.s.	n.s.

Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

As it can be seen in the table above, only the perception of the parents' involvement in school activities shows a significant, though rather small, effect on the educational attainment, and only for the Language scores. Whether it is the vagueness of the concept, because of a deficient operationalisation of theory or precisely because of a lack of it, these results make it evident that the data collected has important limitations for giving an accurate account of the climate in schools. Particularly, this may suggest the problem is more evident in the teachers' and head-teachers' questionnaires, as the variables from the students' questionnaires related to their subjective experience in school do show significant and important coefficients (e.g. bully and students' educational aspirations). In any case, this is another case in which the impossibility of distributing the praise and the blame in this kind of analysis makes it very difficult to unveil the cause of the problem, and therefore its possible solutions. For that, it would be necessary to carry out further research to produce information with enough detail to develop a sound theoretical framework relevant for the specific context in which schools are inserted.

Table 32. Regression coefficients for the variables measuring school management. School level.

Variable name	Language		Mathematics	
	Coefficient	Standard error	Coefficient	Standard error
s_h_admin_controls	n.s.	n.s.	n.s.	n.s.
s_h_admin_planning	n.s.	n.s.	n.s.	n.s.
s_h_consultancy	n.s.	n.s.	n.s.	n.s.

Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

Likewise, the variables exploring the head-teachers' statements about their practices regarding administrative controls; administrative, academic and pedagogic support offered to teachers and other staff; and administrative planning, have no significant effects on the schools outcomes. Even if there is no enough evidence to offer a conclusive explanation of these results a hypothesis combining the arguments exposed in the last two groups of variables can be made. That is, the no significance of the variables exploring the managerial strategies of the head-teachers might be related to the lack of fit between the theoretical perspective from which the operationalisation of the variables in this group seem to have been carried out (i.e. the rational approach to organisation theory[33]) and the empirical phenomena. The fact that there are studies that find this concept as relevant for school outcomes while exploring it in a coherent, theoretical based and contextualised form (e.g. SEP, 2001), would provide support either for this argument or to make evident the lack of a sound theoretical framework in the construction of the instruments to collect the data.

[33] To review the variables forming the indices in this group, see the "construction of indices" section of this chapter.

Table 33. Regression coefficients for the variables measuring opportunities to learn. School level.

Variable name	Language		Mathematics	
	Coefficient	Standard error	Coefficient	Standard error
s_t_educative_resources	n.s.	n.s.	n.s.	n.s.
s_t_time_preparation	n.s.	n.s.	n.s.	n.s.
s_t_work_plan	n.s.	n.s.	n.s.	n.s.
s_t_homework_feedback	1.643	0.675	1.826	0.733
s_t_teacher_absent	n.s.	n.s.	n.s.	n.s.

Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

The last group is formed by the variables exploring teachers's answers about the availability and the frequency of use of educational resources, the time they spend preparing their lessons, the proportion of teachers who develop a plan for the academic year, a measure of teachers' absenteeism and the proportion of homework that they comment and review. Among these, only the last one showed a significant influence on school outcomes for both of the dependent variables. So, it can be said that the effort teachers invest in reviewing and giving feedback on the school homework handed in by students contribute in a positive, though small, way to improving the educational results of students.

Regarding the other variables, a similar explanation for their non significance that the one exposed above can be hypothesised. Thus, this result also makes evident the need for refining the instruments used to collect information about the relationships among the actors of the education system and the mechanisms underlying them. For this, the natural perspective on organisations seems to be the most adequate one.

The fourth analytical question is:

5.2.4 Do the effects of the individual socioeconomic factors on educational achievement differ across schools? In other words, are there some schools more equitable than others in terms the characteristics evaluated?

In the previous model, school effects on the mean attainment were made possible by allowing the intercept of the regression of attainment on the independent variables to vary randomly across schools. However, it was assumed that the effects of the independent variables on the students' attainment were the same for all schools. In other words, the slope of the regression line was fixed across schools. Now, in order to answer the fourth research question, the previous random intercept model was extended to allow for random slopes too.

In order to make simpler the formal explanation of the model, it is supposed that only one explanatory variable is included, e.g. *students' socioeconomic capital* (x_1). Thus, the model can be formally expressed as follows:

$$y_{ij} = \beta_{0j} + \beta_{1j} x_{1ij} + e_{ij}$$
$$\beta_{0j} = \beta_0 + u_{0j}$$
$$\beta_{1j} = \beta_1 + u_{1j}$$

where:

y_{ij} is the score in the Mathematics or Language test obtained by the student *i*, in the school *j*

β_{0j} is the estimated average score obtained by students in either test. Also known as the great mean or the intercept. The addition of the subscript *j* indicates that the intercept is allowed to vary randomly across schools and, therefore has a residual associated (U_{0j}).

β_{1j} is the estimated effect of the variable x_1 (*students' socioeconomic capital*) over *y* (the score in the Mathematics or Language test). Again, the addition of the subscript *j* indicates that the slope corresponding to the effect of x_1 on *y* is allowed to vary randomly across schools and, therefore has a residual associated (U_{1j}).

x_{1ij} is the value of the variable *students' socioeconomic capital* for the student *i* in the school *j*.

U_{0j} is the deviation of the average score in the school *j* from the average score across schools or the great mean. Also known as the residual at the school level. The subscript *0* indicates that the residual associated to the intercept (which is also marked with a subscript *0*).

U_{1j} is the deviation of the average effect of the variable x_1 in the school *j* from the average effect across schools. This also a residual at the school level. The subscript *1* indicates that this residual associated to the slope of the effect x_1 on *y* (which is also marked with a subscript *1*).

e_{ij} is the deviation of the score obtained by the student *i* from the average score in the school *j.* Also known as the residual at the student level

u_{0j}, u_{1j}, e_{ij} are random coefficients, not correlated, normally distributed with mean = 0 and which variances (δ^2_u, δ^2_{u1}, δ^2_e) and covariance (δ_{u01}) will be estimated

In this fashion, in order to test whether the effect of the explanatory variables on the educational attainment varies across schools, a likelihood ratio test can be used (Steele, 2008). One random slope is estimated at a time. The criterion to

decide whether the variability is significant or not is based on the difference between the value of the -2*log-likelihood of the random slope model and the one with fixed slope; then, this difference is referred to the Chi square distribution, where the degrees of freedom are determined by the number of additional parameters in the model.

The next table shows the results of evaluating the significance of random slopes models for the variables considered theoretically relevant in defining socioeconomic school (in)equalities.

A significant difference between the fixed and the random slope model means that the effect of the corresponding variable varies across schools. In other words, the significance of a random slope model for a given variable means that there are differences in the way schools "filter" the effect of this variable on the attainment of their students: some schools are more equitable than others regarding the effect of a specific variable.

Table 34. Differences between the models with random and fixed effects.

Variables	Differences	
	Language	Mathematics
Reference -2*log-likelihood	396657.819	514882.342
oportunidades	10.336	7.032
socioeconomic_capital	n/a	n/a
work_out_home	5.929	8.162
s_educational_aspirations	21.316	61.651
Reading	8.574	13.023
Homework	n.s.	n.s.

Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)
All the coefficients are significant at 5%

As it can be seen in the table above, the effect of most of the socioeconomic characteristics of the students on the educational attainment varies significantly across schools. However there are important differences regarding the magnitude of the differences. For both subjects, the effect of the educational aspirations shows the greater differences. Therefore, it can be said that it is in the ability to decrease the differences in attainment resulting from different educational aspirations where schools vary the most. In other words, schools vary in their capacity to compensate for low educational aspirations or to boost

the attainment of their students based on their high educational aspirations. Similar explanations can be developed for each variable, so, it can be said that in general terms schools vary in their capacity to compensate for the socioeconomic and cultural differences of their students.

Apart from the magnitude of the differences across schools, the importance of these results can be evaluated with different criteria, for example, in function of their theoretical implications or their practical applications in terms of public policy. So, for example, in the case of the variable “oportunidades”, the fact that schools vary in their capacity to compensate for the social disadvantages of the beneficiaries of this programme is a very important one. As it was explained before, Oportunidades cater for families living in extreme poverty conditions (and normally with very low levels of social, cultural and economic capital). That is, using strategies like conditioned cash transfers; this programme is bringing to school children who otherwise would be working instead. Now, the way in which the Mexican lower-secondary schools receive and treat these students vary in a significant way. There are schools that compensate better for the structural disadvantages of these students.

If the mechanisms underlying these (in)qualities can be disentangled and explained with sound theoretical support, there will be firm elements to redesign the policy initiatives related to them. The next research question is then focused precisely in the proposal of theoretical models to explain such inequity patterns. However, before attempting to propose such theoretical explanations, the close and constructive replication phases will be carried out.

5.3 Close and Constructive Replication

During the core analysis, empirical regularities have been suggested regarding the percentage of the variation in the educational achievements that is due to differences between schools and students, the characteristics of schools and students that have an effect on attainment, if these characteristics remain constant across different socioeconomic contexts, and what individual socioeconomic characteristics vary across schools. The theoretical justification

and some possible explanations for the mechanisms detected have also been discussed. That is, emergent data patterns about the inequity factors and mechanisms of lower-secondary education in Mexico have been established in the light of a theoretical framework.

Now, this stage is focused on determining to what extent these data patterns hold across different samples / sub-samples, methods of analysis and datasets. The central objective is to confirm the patterns detected in the previous stage and ascertain their generalisability. To do this, the findings of the core data analysis will be compared to the results of other works carried out with similar objectives.

The Close Replication refers to the comparison to other works carried out using the same datasets in order to confirm empirical patterns. There are only two studies available that have used the EXCALE 2005 datasets (INEE, 2006), both of them carried out by the INEE's own research team (Backhoff, Andrade, et al., 2006; Backhoff, Bouzas, Contreras, Hernández, & García, 2007). The results of both works are very similar; however, the more recent one will be used for the close replication phase as it gives more details regarding its theoretical orientations, the methodological decisions are justified in a more convincing way and the indices created from the single variables keep greater similarities with the ones created for this thesis.

In the Constructive Replication, the main objective is to asses the extent to which the empirical patterns detected can be generalised across different methods of analysis and datasets. To do that the results obtained in the last phase of the analysis will be compared to the findings of other works that, while having similar objectives, have used different datasets and methods of analysis. The main characteristics of the three works selected for the constructive replications are described in the next table.

Table 35. Works included in the constructive phases

		Replication			
		Close	Constructive		
Reference	This work	(Backhoff, et al., 2007)	(Sandoval-Hernández & Muñoz-Izquierdo, 2004)	(Tristan Lopez, et al., 2008)	(Blanco, 2007)
Data set	EXCALE, 2006 (Educational Quality and Achievement Test)	EXCALE, 2006 (Educational Quality and Achievement Test)	EXANI I, 1999 and 2003 (National Test for Accessing to the Upper-secondary Education)	PISA, 2006 (Programme for the International Student Assessment)	Estándares Nacionales (EN), 2004 (National Standards in Education)
Institution	INEE (National Institute for Educational Assessment and Evaluation)	INEE (National Institute for Educational Assessment and Evaluation)	CENEVAL (National Evaluation Centre for Higher Education)	OECD (Organisation for Economic Cooperation and Development)	INEE (National Institute for Educational Assessment and Evaluation)
Main method of analysis	Multilevel models	Multilevel models	Linear regression, ANOVA and Chi square	Multilevel models and Structural Equations	Multilevel models
Educational level	Lower-secondary	Lower-secondary	Lower-secondary	15 years old children	Primary

Much has been said in this work about the problems of not taking into account the context in which findings have been obtained, and also about the problems of mixing results when their theoretical fundaments are incommensurable. For this reason, special attention was paid to these elements in the selection of studies for the constructive replication phase.

As it was said before, in the case of the study carried out by Backhoff and colleagues, the fact that the study uses exactly the same datasets eliminates the possibility of any problems of de-contextualisation (i.e. the sample refers to the same population) or incommensurability (i.e. the data collected is *impregnated* by the same theories); however, the similarities with this work add to the robustness of the results because it uses a different methodological approach (e.g. indices are created following different criteria, it follows a different modelling strategy, it uses a suite of different statistical software etc.).

The next study (Sandoval-Hernández & Muñoz-Izquierdo, 2004), represents and attractive case for comparison, on the one hand because the dataset that it uses refers to a population and context that keeps, at the same time, interesting similarities and differences to this work. Like the EXCALE, the EXANI I is an standardised test that is applied at a national level to students at the end of the lower secondary education. However, while the main objective of the EXCALE is to evaluate the National Education system, The EXANI I is concerned to the individual assessment, because based on their results in the test students have the opportunity to select their preferred educational institution. Other important difference is that the EXANI I is only applied to the students who intend to carry on studying in the upper-secondary level, while the EXCALE is applied to a representative sample at a national level.

From the methodological point of view, this study is the only one that does not use multilevel models as it main statistical tool; instead, it uses simple linear regressions and confirms some of its results with other bi-variate statistical techniques. Finally, and maybe more importantly, the theoretical impregnation behind the analysis and treatment of the data has important similarities with this work, especially regarding the socioeconomic characteristics of the students and their families (i.e. they both use reproduction theories).

The next study (Tristan Lopez, et al., 2008) reports the results of a multilevel analysis of the results of Mexico in PISA 2006. PISA is an internationally standardised test that is administered to 15 years olds in school (this is also the normative age of the students in lower-secondary education in Mexico). This test, as well as the EXCALE, is focused on evaluating the education system as a whole, nevertheless, in contrast to EXCALE, PISA does not asses the performance of students in terms of mastery of the school curriculum, but in terms of the knowledge and skills judged as necessary for the adult life.

The relevance of the study carried out by Tristan Lopez and colleagues (2008) for the constructive replication phase, is more evident if it is considered that the theoretical framework they used for the analysis is the Model of Educational Quality developed by the INEE, which, in turn, is the theoretical basis on which the EXCALE was developed. Although this does not give complete certainty to

the theoretical commensurability of these two works, it does assure consistency in the use of many theoretical elements and in the strategies followed for the statistical treatment of data.

The last work (Blanco, 2007) uses a dataset corresponding to the 2004 application of the Estándares Nacionales test. This test is the predecessor of the EXCALE (so it was also developed by the INEE), therefore has very similar objectives, characteristics[34] and theoretical fundamentals (although they are not explicit). It is also representative at a national level, but in contrast to all the other studies, it refers to the students finishing the primary education. Despite the contextual differences that this may imply, it was included in the replication phase because the theoretical framework used by the author for the analysis of the data has very important similarities with the one used in this thesis (e.g. the use of a mixed reproduction and social capital theories for the student level characteristics and organisation theories for the school level ones). It has to be said that the decisions that guided the strategy of its statistical analysis were not always faithful to this theoretical framework; that is, many decisions were made in an empiricist fashion (e.g. variables were grouped into indices attending only to statistical criteria). However, the discussion of the results relies heavily on the theories mentioned before, and therefore it offers significantly consistent bases for a fruitful comparison.

In the next table a comparison of the main findings of the studies described above is presented, where the similarities are seen as evidence to confirm the existence of the emergent empirical patterns in the context of the Mexican basic education. The categories used for the comparison are based on the research questions guiding this thesis.

It is important to point out that even though the main criterion for the inclusion of the studies in this replication phase was a shared context and the commensurability of the theories impregnating their data, there are still important limitations that make unfeasible a direct / linear comparison. For example, the operationalisation of single variables and the construction of

[34] According to the INEE (Backhoff, Andrade, et al., 2006), one of the main advantages of the EXCALE over the Estandares Nacionales test, is that the first will be technically comparable with its following applications and so, it will allow to carry out the so-called value added studies.

indices followed quite different strategies in every case, thus variables with very similar names are actually measuring different concepts. For example, all the studies consider the concepts of economic and/or cultural capital, however, in some studies these two concepts are integrated into one variable and in some others they are kept separate; in some studies cultural capital is formed only by the level of education of one or both parents and, in other studies, it also includes information about other cultural practices. For this reason the summary of the comparisons presented in the next table does not reach the level of single factors or variables.

In the next table then, the first two columns present the first four research questions set for this work and a simplified summary of the main findings that address them; the next column corresponds to the Close Replication phase of the analysis, that is a comparison of the results of this work to the results of other studies that have used exactly the same dataset (EXCALE, 2006); the next three columns correspond to the Constructive Replication phase of the analysis and show the results of three other studies that had similar objectives and used different datasets (EXANI I, PISA, EN). The objectives, as it has been mentioned, are, first to confirm the existence of the emerging data patterns identified in this research (Close Replication), and second to evaluate their generalisability within the context of the basic education in Mexico (Constructive Replication).

Table 36. Close and constructive replication

Main results of this work		This work	Close	Constructive		
			EXCALE	EXANI I	PISA	EN
Percentage of the variation in the educational achievements that is due to differences between states, schools and students		States: 5 to 11% Schools: 16 to 32% Students: 63 to 72%	States: n/a Schools: 24 to 33% Students: 67 to 77%	States: n/a Schools: n/a Students: n/a	States: 6.40% Schools: 44.30% Students: 49.40%	States: 4 to 7% Schools: 25 to 28% Students: 71 to 65%
Variables with a significant effect on educational achievements (groups of variables)	Student variables	Demographic characteristics:				
		gender (-)	n/a	-/+	-	-
		age (-)	-	-	-	n.s.
		indigenous (-)	+/-	n/a	n/a	-
		Economic and cultural characteristics:				
		oportunidades (-/+)	n/a	n/a	n/a	n.s.
		work (-)	-	-	n/a	-
		aspirations (+)	+	n/a	n/a	+
		reading (+)	n/a	n/a	n/a	+
		homework (+)	+	n/a	n/a	n/a
		Family social capital:				
		both parents (-)	n/a	n/a	n/a	n.s.
		academic sup. (-)	n/a	n/a	n/a	n/a
		personal sup. (+)	n/a	n/a	n/a	+
		parents asp. (+)	n/a	n/a	n/a	n/a
		alcohol/tobacco (+)	+	n/a	n/a	n/a
		conflicts at home (-)	n/a	n/a	n/a	n/a
		Opportunities to learn:				
		absences (+)	n/a	n/a	n/a	n/a
		teacher absence (-)	-	n/a	n/a	n/a
		books (+)	n/a	n/a	n/a	n/a
		housework (+)	n/a	n/a	n/a	n/a
		bully (-)	n/a	n/a	n/a	n/a
	School variables	School composition:				
		age (-)	-	n/a	-	n/a
		school type (-/+)	-/+	n/a	-/+	n.s
		work (-)	-	n/a	n/a	-
		socioeconomic (+)*	+	n/a	+	+
		aspirations (+)	n/a	n/a	n/a	+
		School resources:				
		equipment (+)*	+	n/a	+	+
		training (+)*	+	n/a	n/a	+
		other job (-)	n/a	n/a	n/a	n/a
		School climate:				
		parents involv. (+)	n/a	n/a	n/a	n/a
		Opportunities to learn:				
		homework feed. (+)	+	n/a	n/a	n/a

Students' characteristics which effect on educational attainment vary depending on the socioeconomic composition of schools.	gender (+)	n/a	n/a	n/a	n/a
	indigenous (-)	n/a	n/a	n/a	n/a
	socioeconomic (+)	n/a	n/a	n/a	n/a
	oportunidades (+)	n/a	n/a	n/a	n/a
	work (-)	n/a	n/a	n/a	-
	aspirations (+)	n/a	n/a	n/a	n/a
	reading (+)	n/a	n/a	n/a	+
	academic sup. (+)	n/a	n/a	n/a	n/a
	personal sup. (+)	n/a	n/a	n/a	+
	parents' asp. (-)	n/a	n/a	n/a	n/a
	conflicts at home (+)	n/a	n/a	n/a	n/a
Students' characteristics regarding which schools show different degrees of equitability	age	n/a	n/a	n/a	n/a
	oportunidades	n/a	n/a	n/a	n/a
	work	n/a	n/a	n/a	*

n/a = variable no considered in the analysis or not reported
n.s. = variable did not show significant effects in the analysis
* = important differences in the operationalisation of the variable

As can be seen in the table above, the percentage of the variation in the students' attainment that depends on characteristics of the federal states ranges from 4 to 11 percent, for the schools the range is 16 to 44% and for the students 49 to 72%. Even though at first it may seem that the ranges are too wide, it has to be considered that not all the studies in the comparison use the same independent variables to measure students' attainment. The work based on the PISA dataset is the only one that uses the students' score in Science as a dependent variable, and this is also the work reporting the higher amounts of variance explained at the schools' level and the lowest at the students'. Furthermore, even when the other studies used Language and Mathematics scores as dependent variables, there are also important differences between these two subjects. So, for example, if only the Language scores are considered, the range of the explained variance across levels narrows considerably: 5 to 7% for the states' level, 28 to 33% for the schools and 63 to 67%.

In this way, from the analysis above two relevant conclusions for this study can be made; that is the existence of two empirical patterns have been confirmed and their generalisation can be established for the Mexican context. The first is that, concurring to the international literature, with variation in the students' attainment that can be explained by the characteristics of the states, schools and students varies across different subjects. The second is that, in general terms, less than one third on the variation in the students' attainment can be

explained by the schools characteristics, while the students' characteristics explain slightly less than two thirds and the states the remaining percentage.

Regarding the variables that were found to have a significant effect on the students' attainment, the first thing to notice is that there are not many variables showing significance across the five studies. This can be explained at least by three reasons: first, the context questionnaires accompanying the standardised tests of each study contain different information; this difference is more obvious when comparing the instruments that were not developed by the INEE. For example, the study based on the EXANI I datasets counted on a context questionnaire with a reduced array of information, i.e. it basically contains socioeconomic information about students and their families. Second, different strategies for the construction of models quite often lead to different results (Twisk, 2006), therefore, it is possible that some of the differences are due the different modelling strategies utilised. Third, as in the present research, most of the studies in the comparison had a very high number of single variables to deal with, so in all of them the construction of indices was part of the analysis strategy. However, the criteria used to group the variables in indices were also different. While in most of the studies these criteria followed mainly to *common sense* and technical/empirical evidence*,* in this research such decisions were made on a theoretical basis.

Nevertheless, despite these inconsistencies, some similarities can be found across the results of the studies compared. For example, drawing on the *Close Replication* phase, it can be said that the empirical patterns emerging from this research were confirmed for the following variables:

At the student level, being over the normative age and having a remunerated job out of home has a negative effect on the students' attainment; while having high educational aspirations, doing school homework and consuming alcohol and tobacco have positive effects. As was discussed, all these results, with the exemption of the last one, were somehow expected and confirm the hypothesis established for each variable. However, the fact that, contrary to what was expected, in both studies the relationship between the consumption of alcohol and tobacco and student attainment showed positive and strong coefficients

across the two subjects evaluated, confirm also the need of more detailed investigation in order to explain this apparently unusual result.

At the school level, the absences of teachers and teachers having an additional job has a negative effect on the student attainment; while the type of school , if it is private or if it is a telesecundaria has positive effects. Although this result was expected for the private schools, the fact that telesecundarias also has a positive effect opens interesting paths for future research. This is because, telesecundarias are characterised for being located in the most disadvantaged areas, having the lowest levels of socioeconomic composition, the poorest infrastructure conditions and the least experienced and trained staff (Backhoff, et al., 2007; Lara, 2008). However, once these characteristics are controlled for, telesecundarias showed a consistent positive effect on school outcomes. Furthermore, for the Mathematics scores, telesecundarias seem to have the highest performance among all the types of school (i.e. general, technical or vocational and private). Again, the confirmation of this empirical pattern draws the attention to the need of investigating this school modality in a deeper fashion.

Also at the school level, the average number of students above the normative age, the proportion of students with a job outside home and the school aggregated variable for the socioeconomic capital of students showed a significant effect on school outcomes; the first two in a positive way and the last in a negative one. These results are consistent with the theoretical framework of this work, however, it has to be noticed that the corresponding indices measuring the socioeconomic conditions of the families are constituted by a different configuration of variables. In the case of this work, the socioeconomic capital is formed by proxy variables for two of the forms of capital identified by Bourdieu, i.e. economic and cultural; while in the work carried out by Backoff and colleagues only the variables related to cultural capital are taken into account. Therefore the confirmation of this empirical pattern has to be taken with caution.

Finally, the indices measuring the condition and availability of equipment in the school, the amount of training taken by teachers and the proportion of

homework that receives feedback from teachers has a positive effect on the academic achievement in both studies. So, in the same way, it can be said that the empirical patterns involving the relationship of these variables with the school outcomes have been confirmed. Nevertheless, the first two indices present a similar situation as regards the socioeconomic context: the configuration of the group of variables forming them differs in both studies and therefore a full confirmation of their empirical patters would require further evidence.

Now, in respect to the generalisation of the empirical patterns confirmed by the close replication (i.e. *Constructive Replication*), the results boil down to three students' characteristics: gender, being over the normative age and having a remunerated job outside home at the student level; and two schools' characteristics: the socioeconomic composition of the school and the condition and availability of equipment. However, the same limitations due the different operationalisations apply for the variables at the school level.

In the case of gender, it can be said that the negative effect of being a girl over the Mathematics students' attainment is a generalised empirical pattern in the context of the Mexican basic education. Similarly, the negative effect of being over the normative age also can be considered a generalised empirical pattern, in this case for both, the Language and the Mathematics scores. In the same manner, it is a generalised empirical data pattern that having a remunerated job outside home affects the students' attainment in a negative way. The generalisation of these factors can be established as they refer to single variables for which no operationalisation was required. However, it is safer to establish the generalisation of patterns at the level of theoretical related groups of variables. This is because, as it has been mentioned above, different modelling strategies can lead to different results. Moreover, the availability of information can also play an important role in the establishment of emergent data patterns, for example in this study, at the student level the socioeconomic capital did not show a significant coefficient, but the participation in Oportunidades and having remunerated work out of home did. Both variables are clearly related to the socioeconomic situation of the students' families; Oportunidades because its beneficiaries are families living in extreme poverty;

and working out of home because it is an expression of the economic need of the family. So, if these two variables are not included in the model (if the information were not available), socioeconomic capital shows a significant coefficient. In that sense, it is safer to say that there are generalised empirical data patterns regarding the relationship between the demographic, economic, cultural and social capital of the students and their families and the school outcomes.

For the school level variables, the generalised empirical data patterns are related to the positive relationships between the socioeconomic composition of the school and the condition and availability of school equipment and students' attainment. In this case, as the variables involved do not refer to exactly the same characteristics, the generalisation of their empirical data patterns has to be taken with caution. In other words, it cannot be said that there is a generalised empirical data pattern regarding the positive relationship between the socioeconomic context (as it was measured and understood in this study) and the student attainment. However, the constructive replication offers enough evidence to say that there is a generalised data pattern regarding the relationship of the cultural, economic and social composition of the school and the academic achievement of its students. In the same way, it can be said that for the Mexican basic education, contrary to the findings from developed countries, there is generalised empirical data pattern regarding the relationship between the school infrastructure and the students' attainment.

Even though the conclusions above may seem too broad, it has to be considered that the methodology proposed by ATOM is a cyclical one, thus, these first generalisations of empirical data patterns have to be refined by subsequent analyses, replications and construction of relevant theoretical descriptions.

It is also important to point out that the similarities in the theoretical backgrounds of this work and the one carried out by Blanco (Op cit), resulted in the use of a set of explanatory variables with important similarities. These variables, resulting from a specific configuration of the indices constructed, were used only in these two works. Although, in strict terms, empirical patterns

cannot be generalised for these variables, it is interesting to notice that in the only two works which they have been used, even though the datasets are different, their effect and importance is confirmed. Among them, the educational aspirations and the personal support of the family can be counted.

The next group of results concerns the establishment of data patterns about the factors that having a significant effect on the educational attainment. These vary depending on the socioeconomic composition of the school. This specific objective was addressed only in the present work and in the one developed by Blanco (Op cit). Even when there is not enough evidence to generalise the patterns detected in this work, some interesting confirmations resulted of the comparison between these two works.

The first one has to do with the increase of the negative effect of working out of home as the schools' socioeconomic composition increases. In other words, the analyses of both studies found that the sensibility of students' attainment to the negative effect of working increases in schools with high levels of socioeconomic composition.

This relationship could be explained by two possible causes. On the one hand, it could be that the negative effect of the socioeconomic disadvantages associated with working students cannot be compensated by the benefits of being inserted in a school with a high socioeconomic composition. On the other hand, it could be that the fact of working before or after going to school limits the time and energy of these students to carry out school related activities (e.g. studying, doing homework) and in spending time with their peers in an in informal context. These possibilities would not allow them to benefit from the interaction with peers with higher socioeconomic levels (e.g. the development of an elaborated linguistic code or the dispositions that would allow them to obtain benefits from the supportive institutional habitus that characterises the schools with high level of socioeconomic composition).

The second hypothesis seems to be more probable when interpreted together with the interaction effect found between the participation in Oportunidades and the socioeconomic context of schools (although this interaction was not tested

for in the study carried out by Blanco). This is because even when the socioeconomic characteristics of the students who are beneficiaries of Oportunidades and the ones working in a remunerated activity are very similar, there is one important difference: one of the main objectives of the Oportunidades' cash transfers is that children go to school instead of working and one requite to keep on receiving the cash transfers is the constant attendance of children to school. Therefore, it could be assumed that children who are beneficiaries of Oportunidades have low levels of socioeconomic capital (they live in extreme poverty conditions), but at the same time have the availability of time and energy to take advantage of the favourable institutional habitus of the schools with high socioeconomic composition.

A second factor where variance across schools with different socioeconomic composition was confirmed by Blanco's work is that of reading. That is, in both studies it was found that the positive effect of reading on academic attainment increases as the socioeconomic composition of the school is higher. This, together with the positive interaction effects found between educational aspirations and the socioeconomic composition of schools (not considered by Blanco either), provides sufficient evidence to assume that positive dispositions towards education in the families (i.e. embodied cultural capital) create a favourable synergy with the institutional habitus of schools.

The third interaction that is confirmed by the results of Blanco is related to the positive interaction between the personal support of the family for the students and the socioeconomic composition of schools. Again, the analyses of both studies suggest that the positive effect of this variable over the students' attainment is strengthened when the school has a high socioeconomic composition. As was mentioned before, this result implies that there might be differences in the types of adult attention that children receive across different socioeconomic contexts. That is, this attention could presuppose a wide range of strategies, from controlling to supportive ones and these strategies vary across schools with different socioeconomic compositions.

Finally, the last research question is concerned with the possibility that schools differ in their ability to compensate for students' socioeconomic disadvantages.

Again, the only study that dedicates part of its analysis to answer a similar question is the one carried out by Blanco (Op cit). Though, this author focused his analysis on what he calls *school processes* rather than in the socioeconomic characteristics of the students. However, both works conclude that schools vary in their capacity to compensate for the negative effect of working on the educational attainment of their students. That is, according to the conclusions discussed above, it can be said that there are significant differences in the actions (and their result) that schools take in order to compensate for the disadvantages presupposed or caused by the child labour; or that schools differ in their ability to transform a high socioeconomic composition into a positive institutional habitus for those coming from disadvantaged contexts.

Ideally, the Close and Constructive replication phases of this analysis would provide enough evidence to confirm and establish the generalisability of the emergent empirical patterns detected in the process of answering the four research questions that guided this analysis of the data. Unfortunately, the literature available does not provide enough information to carry out a full analysis of this kind. Nevertheless, although the results of the replication phases do not hold the desired robustness, they will be used to give an example of the kind of analytical strategies that can be used for the following phase of the analysis proposed by ATOM (which also corresponds to the last research question set for this thesis). It has to be remembered that the main focus of this research is on the extent to which the methodology proposed by ATOM and the critical realist approach is relevant to the SER context; and therefore making an attempt to provide a theoretical explanation in terms of the underlying mechanisms to explain the empirical patterns identified (and to some extent confirmed and generalised) is necessary.

6. Theory Construction

This chapter corresponds to the second stage of ATOM: Theory Construction. The main objective of this stage is the construction of theories to explain the contextually-based data patterns identified, in the case of this work the (in)equity patterns of the lower-secondary education in Mexico. It is important to note that, because of the characteristics of the data available for the analysis (I will come back to this point in the conclusion), the main purpose of this chapter is restricted to exemplifying the methodology developed in chapter 3 in order to analyse its limits and possibilities, rather than to present particular outcomes regarding the (in)equity patterns of the lower-secondary education in Mexico.

This stage comprises three phases: theory generation, theory development and theory appraisal. In the first I will develop some theoretical models to explain some of the results discussed in the last chapter by using existential abduction through Multilevel Structural Equation Modelling techniques; in the second I will attempt to develop these theoretical explanations by explaining the nature of the entities and relationships postulated through analogical modelling.

Finally, it is important to mention that as I have no knowledge of other theories in the field developed in the terms proposed by Haig (Cf. Haig, 2005a), it will not be possible to carry on with the third phase of the Theory Construction stage proposed by ATOM (i.e. Theory Appraisal). This is because its main objective is to assess the empirical adequacy of competing theories and therefore it would be necessary to have other theories to compare with.

6.1 Theory Generation

As the first phase of the Theory Construction stage, the Theory Generation phase has the objective of producing theoretical explanations that are rudimentary and dispositional in nature. That is, the theoretical models generated in this phase cannot be considered as fully developed theories ready

to be evaluated against rival theories. In order to develop these rudimentary theories to that status, ATOM proposes the construction of analogical models of the causal mechanisms implicated in the theoretical explanations, i.e. the Theory Development phase.

So, this section of the thesis is focused on the first phase, and the research question that it attempts to answer is:

6.1.1 Based on the answers to the previous questions, what theoretical models can be proposed to explain the inequity patterns in the distribution of educational achievements?

The theory generation phase uses existential abduction to postulate the existence of unobservable theoretical entities that play a significant role in the explanation of mechanisms underlying the detected data patterns. In general terms, abduction "…consists in studying the facts [or confirmed data patterns] and devising a theory to explain them" (Pierce in Haig, 2005b: 305). So, in the abductive mode of inference the first step consists of presenting a data pattern to be explained or understood; then the second step introduces an available or newly constructed hypothesis and its relevant auxiliary knowledge by means of which the case is abduced (Fischer, 2001: 368-369).

In this fashion, for the first step of the theory generation process we need to choose a confirmed contextually based data pattern from those established in the Replication phases. As was argued, the scarcity of contextually comparable studies did not allow us to claim the strict confirmation of data patterns at the level of single variables. However, it can be safely said that some data patterns were confirmed at the level of theoretically related groups of variables. So, for example, one of the most robust confirmations obtained from the analysis presented above is the relationship between the economic, social and cultural characteristics of the students and their educational attainment.

In the theoretical framework provided for the variables measuring these dimensions, Bourdieu's reproduction theory (for the economic and cultural

capital), the Rational Action Theory (for some dispositions towards education) and the Coleman's social capital theory (for the social capital in the family) were used.

Also in the theoretical framework, it was established that, given that different theories may assume different degrees of social determinism, in order to keep coherence within the theoretical framework it is necessary to show how the theories can be integrated. To establish that link, some discussion about the basic concepts of the architecture of theories was presented. Then, drawing on the indeterminacy of some of Bourdieu's concepts, a path was opened to establish links between the theories involved. This indeterminacy was found in a more flexible account of *habitus* developed by Bourdieu in some of his recent works which enabled coherence to be established with rational action theory. On this basis it could be argued that the limits and possibilities of choice for working class students is a matter of empirical analysis. For example, in the light of the results of the present analysis, we may ask to what extent the *habitus'* social determinism can be overcome and under what conditions this is possible.

So, the first thing to do is to look for empirical evidence of this possibility. There are several ways to do it. We could use, for example, any or some of the variables measuring the economic, cultural or social students' characteristics to configure a sub-sample and then analyse its educational attainment. However, based on practical, theoretical and empirical arguments, it was decided to use the variable indicating whether the students' families are beneficiaries of Oportunidades.

6.1.2 Opportunidades: A Case Study in Theory Generation

On practical grounds, Oportunidades is the best option because, i) it was not tested in most of the studies included in the Replication phases, it is easily identifiable and it is included in most of the different data sets available. Furthermore, it is a categorical variable with only two possible options (i.e. students are beneficiaries or not); ii) the fact that it represents a national public

policy programme makes it easy to be tested at a national, state or regional level, and also allows for different strategies of comparison; iii) the existence of an accurate registry of beneficiaries makes it easy to identify them at all levels and, therefore, strategies to address their needs or boost their capabilities can be taken at any level too (i.e. classrooms, schools, states, etc.); iv) the beneficiaries of the programme participate in different activities as a requisite for receiving cash transfers (e.g. talks and meetings on different topics), thus, advantage can be taken of these activities to include possible recommendations for policy intervention resulting from this analysis.

From the theoretical point of view, the main requisite for being a beneficiary of this programme is that the families are evaluated as living in extreme poverty conditions. Oportunidades applies a rigorous beneficiary identification system by means of socioeconomic and demographic criteria and its support is focused on families living in communities that show the highest indexes of marginalisation and fewer possibilities of human development (Cf. Secretaria de Desarrollo Social, 2009), as a result, there can be assumed important parallels with the concepts of the theories included in the theoretical framework, especially with those of economic, cultural and social capital and habitus. Since the process of identification of beneficiaries is completely independent of the construction of the socioeconomic and cultural variables contained in the dataset analysed in this work, it provides an independent way from the classification used in this study. Furthermore, the fact that the main strategy of this programme consists in direct cash transfers to the beneficiaries adds an interesting element to the formula; the extra money is meant to cover the opportunity costs of having the children in school instead of working, and therefore modifies the basis on which families judge it convenient to keep their children in the education system and for how long (i.e. rational actions), in turn this may have an effect on their dispositions towards education (i.e. incorporated cultural capital).

Finally, Oportunidades represents a good option from an empirical perspective because it was one of the variables for which schools differ in their ability to compensate for students' socioeconomic disadvantages (see research question 4). That is, the educational attainment of those students who receive support

from Oportunidades varies across schools. This suggests, on the one hand, that something can be done/modified at the school level to improve the way in which these students are treated in order to enhance their educational attainment; and on the other, that under certain circumstances socially disadvantaged students, as characterised by Oportunidades, can obtain similar or even better educational results than their more advantaged peers.

The second claim can be easily tested. To do that, the next table shows the proportion of students receiving support from Oportunidades in the total sample and, among them, the proportion of students who obtained Language and Mathematics scores above the mean for all students.

Table 37. Students with Oportunidades and their scores

Oportunidades			Students with a score > the mean			
	number	%	Lang	%	Math	%
yes	15,575	29.81	6,057	38.89	6,810	43.72
no	36,676	70.19	20,520	55.95	19,309	52.65
total	52,251	100	26,577	100	26,119	100

Source: Own calculation based on EXCALE 2005 data sets (INEE, 2006)

As can be seen in the table above, 15,575 of the students in the sample receive support from Oportunidades, for whom 39% and 44% obtained scores above the mean in Language and Mathematics, respectively. So it can be said that, from the empirical information utilised in this work, we have found evidence of a surprising contextually based data pattern regarding the possibility of overcoming the disadvantages supposed by the habitus that characterises the families living in extreme poverty conditions –as assumed by a determinist account of the habitus.

The next step is then to introduce an available or newly constructed hypothesis to explain the fact that a considerable proportion of students with important structural disadvantages still obtain educational results above the average.

In order to provide more elements for the evaluation of the theories available, it is convenient to analyse in a deeper fashion the apparent mismatch between the concepts of the reproduction theory and the empirical data just presented.

There are several factors mediating the effect of the different types of capital over the educational attainment of students. Some of them were measured, reported and theoretically justified in the analysis above, for example the social dynamics within the family, students' and parents' education aspirations, the time students spend in school related activities, etc.

However, even though the Mexican social structure shares some of the characteristics of developed capitalist societies, it has some others that make it considerably different in several aspects. For example, in contrast to French society, in Mexico the class division is accompanied by a profound social inequity that has its origins not in industrial capitalism, but in the colonisation and independence processes[35]. Moreover, the urbanisation processes and the symbolic construction of the State and its legitimacy also followed remarkably different paths and obtained very different results in terms of the development of class.

So, given that determinist reproduction theories cannot provide theoretical elements to give an account of such surprising data patterns, the next obvious candidates are the concept of Social Capital developed by Coleman and Rational Action Theory. As it has been said, from Coleman's perspective, social capital is part of a theoretical strategy that takes rational action as a starting point, but rejects the extreme individualistic premises that often accompany it by taking account of the social structure (Coleman, 1988: 95). In this way, social capital would be represented by those aspects of the social structure that can be used by actors to achieve their interests. However, this theoretical perspective does not give an account of how such interests are formed, nor a detailed account of how the elements composing the social capital interact to each other in order to this to happen. Furthermore, this theoretical perspective also shares the limitations of the (de)contextualisation with the reproduction theories.

[35] As Blanco (2007) points out, it is important to consider that the reproduction theory is originally thought to provide explanations for the phenomena occurring in places and times characterised by substantial social divisions based on culture of class (e.g. industrial capitalism in 1960-70 in France). In such contexts, the persistent division between manual and white-collar workers generated a social structure with very limited possibilities for social mobility; in turn, the persistence of this social structure generated strong cultures of class with well differentiated values, practices, aspirations, sensibilities and cultural dispositions (i.e. habitus).

6.1.3 Theory of Resilience.

In this way, the auxiliary knowledge that is needed to give force to the hypothesis that under certain circumstances disadvantaged students can obtain educational achievements above the average will be taken from the Theory of Resilience. Specifically, this auxiliary knowledge will be taken from the concepts developed by Silas Casillas (2008) in the context of a study investigating resilience mechanisms in Mexican basic education. The roots of Resilience Theory can be tracked back to psychology studies 70-80 years ago, however in the last two or three decades this field of study has become broader and resilience studies have been address also by social workers, sociologists, educators, and policy makers, among others (Van Breda, 2001:14). Following Van Breda, in general terms, the main focus of resilience theory is on "…the strengths that people and systems demonstrate that enable them to rise above adversity" (p. 14).

Under this tradition, based on the ecological-transactional model of resilience developed by Bronfenbrenner (1979), the work carried out by Silas Casillas (op cit) explored the factors that students coming from areas with the highest indexes of marginalisation perceive as determinants in their permanence in the education system after completing compulsory education (i.e. lower-secondary school). The methodology employed to collect the information was a set of interviews with 29 individuals in 16 communities, as well as with significant others around them (e.g. parents, uncles, teachers, community workers and other significant adults). The main results of the study can be condensed in a model that includes the actors and the processes intervening in the successful school trajectories of the individuals identified as resilient.

In the model of resilience proposed by Silas Casillas, these actors and processes are grouped according to the dimensions of the Bronfenbrenner's model, namely personal, family, school and community. The next figure shows a graphical representation of Silas Casillas' model.

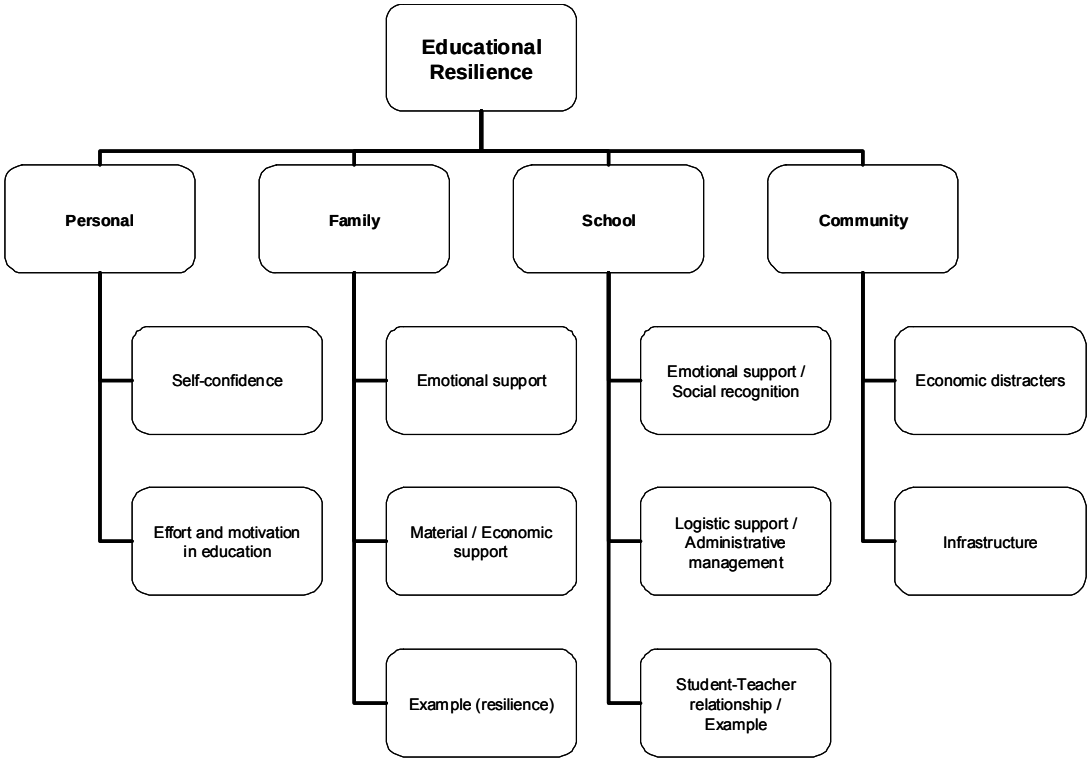


Figure 2. Model of educational resilience in the Mexican basic education

According to the author, the first dimension is the most important as it is the only one that is essential for the process of resilience. That is, even if the other three dimensions present favourable conditions, educational resilience would not work without the manifested determination of the subject. Furthermore, the personal dimension is found to be the one that explain and some times strongly influences the family dimension of resilience. As shown in the figure above, the personal dimension is constituted by two elements: self confidence and effort/motivation. The first one is related to the processes through which the subjects reinforce their auto-concept as resilient persons in education. It is mainly associated with past experiences in schools contexts and can be expressed in the subjective possibility that individuals achieve specific educational goals. The second one is based on the value individuals give to education and it is normally manifested in the commitment and steady persistence in specific courses of action that are judged to lead to educational success. More specifically, it can be associated with the importance assigned to, and time individuals spend in school related activities.

The second dimension of resilience identified by Silas Casillas (Op cit) is the familial. This dimension has three main elements, namely emotional support, material or economic support and example of resilience. These three dimensions are found to be influenced and somehow configured by the personal dimension because when an individual has self-confidence and is engaged in a dynamic of perseverance towards educational objectives he/she will look for support and example in different members of the family (nuclear or extended).

However, the emotional support is most commonly found in the nuclear family and plays a very important role in the reaffirmation of the individuals' self-confidence and motivation towards education. It normally takes the form of recognition of the educational achievements, encouraging words or adult attention paid to the personal and academic activities of the subjects.

The economic or logistic support has to do with the provision of the material resources needed for the individual to perform well at school. It involves a complex series of interactions, power dynamics and negotiations within the family members; for example it can take the form of economic resources directly provided by the parents or older siblings to pay for the opportunity cost of having some family members at school[36]; some other times it takes the form of actions to make the resources available, like meeting the conditions required to receive the Oportunidades' cash transfers (e.g. attendance at meetings, talks, medical check-ups, etc.), or sparing the time for the individuals to develop school related activities (e.g. exempt students from housework or participation in agricultural activities) at the expense of other members of the family. The designation of family members who will stay in school depends on the evaluation of their subjective probabilities of educational success, which in turn is mainly based on the proven academic performance. The result of these negotiations normally plays a double role in the resilience process; on the one

[36] According to Silas Casillas (2008), these resources very often come from the family members who have migrated to the nearby cities or to USA. The symbolic sacrifice represented in the action of leaving home and carrying out physically demanding jobs in order to sustain the family, the explicit and manifested desire of the *leavers* for not reproducing this situation, and the magnitude of the migration phenomena in the Mexican disadvantaged communities, make this particular finding to be worthy of further and particular investigation.

hand reinforces the motivation for education and the continuance of the practices of persistence and perseverance, and on the other lays important amounts of pressure on the individuals.

The third, school dimension of resilience, also has three elements which are in themselves very similar to the ones provided by the family and, in many cases, act as substitutes or complements. These elements can be identified with the same names as the family ones: emotional support, logistic support and role models of resilience. In this case the emotional support is mainly provided by the teacher and by the peers. It has mainly the same function than the emotional support provided by the family: motivation, encouragement and personal and academic reassurance. This academic reassurance normally follows a process in which the teacher identifies an academic activity or subject in which the individual is especially good at, and then concentrates the attention on it, praising the students for his or her achievements with social recognition from teachers and peers.

The logistic support is related to the perceptions of individuals in relation to the physical conditions of the school, the infrastructure and equipment available and the links of the school with the families. What is important is the relative and subjective perception of the individuals of these resources. Their evaluation of the sufficiency of the infrastructure and the physical conditions of the school and classrooms, for example, will depend on their personal living conditions. Additionally, school logistic support is also understood as the actions and negotiations to facilitate the access to scholarship programmes and other kinds of governmental support. This is especially important in geographically isolated communities where such information arrives in dribs and drabs and where the school is the main point of contact.

The third element of the role model is is mostly represented by the teachers who in many cases are good examples of resilience, as they normally are in a situation that can be considered as desirable by the students coming from disadvantaged contexts (e.g. they normally have higher levels of education and socioeconomic status).

The final dimension of resilience proposed by the results of Silas Casillas' work (Op cit) is the Community. This dimension has two main elements. The first one is the economic distracters that can modify the perception of the advantages of continuing studying over getting involved in an economical activity. This is very evident, for example, in communities located near tourist sites, where children can easily make some money by offering information or selling memorabilia to tourists or in relation to located in the areas where criminal organisations operate (e.g. drug cartels).

The second element of the community dimension is related to the physical and organisational structures present that facilitate or affect the individual's access to school (e.g. roads, public transportations, public lightening, water supply, sewers and so forth).

Having set out the model for resilience, it is worth pausing to ask how it can be understood as an unobservable entity. It could be argued that 'resilience' is just a nominal shorthand for all the processes identified above. However, it can be argued that these processes require a further unobservable element which is the way individuals combine them to produce 'acts' of resilience. In this respect resilience is both a social and social-psychological process but one that has to be inferred from the data patterns because it cannot be directly observed.

Based on the empirical data patterns confirmed by the analysis presented in this work and the auxiliary knowledge invoked from the results of Silas Casillas, a hypothesis including information for the first two dimensions is proposed[37]. In this way the existential abduction to be carried out in this phase of the analysis can be characterised as follows:

> The surprising contextually based data pattern, *D*, is *confirmed*.
>
> But if hypothesis H were approximately true, and the relevant auxiliary knowledge, A, was invoked, then D would follow as a matter of course.

[37] A full account of the results obtained by Silas Casillas will be presented in the following phase of the analysis.

Hence, there are grounds for judging H to be initially plausible and worthy of further pursuit.

Where:

D = Some socially disadvantaged students, as characterised by Oportunidades, obtain educational results above the average.

H = There are underlying mechanisms that, under certain circumstances, would allow individuals living in disadvantaged contexts to overcome the constraints imposed on them by their habitus and have educational attainment above the average.

A = These underlying mechanisms can be characterised by a network of relationships among a set of individual and family factors that, in turn, form theoretical constructs denominated individual and family resilience.

If the hypothesis supported by the resilience theory is judged to be initially plausible, it will be taken to the next and final phase of the analysis: theory development. In order to judge the initial plausibility of this particular account of the resilience theory to explain the data patterns detected, Structural Equation Modelling (SEM) will be used.

SEM is a collection of statistical techniques that, by using linear regression and factor analysis equations, allow a set of relationships between one or more independent variables and one or more dependent variables to be examined simultaneously (Ullman, 2001: 653).

SEM represents one of the best statistical techniques to test the kind of hypothesis presented above because, as mentioned before, existential

abduction consists in postulating the existence of unobserved theoretical entities, in order to explain the data patterns detected; and similarly one of the main characteristics of SEM is that both dependent and independent variables can be either measured variables or factors (i.e. unobserved variables). Furthermore, apart from the possibility of simultaneously comparing regression and correlation coefficients, means and variances, SEM provides a measure of goodness-of-fit which can be thought of like a measure of the extent to which the theoretical model proposed fitted the empirical data.

Because of the nested structure of the educational data, in the methodology chapter it had been proposed to use multilevel regressions as a part of SEM in order to extend it for multilevel settings. According to Rabe-Hesketh and colleagues (2006), one of the main advantages of this approach is that it allows the inclusion of cross-level paths or relationships from latent or observed variables at a higher level to latent or observed variables at a lower one. However, based on the data patterns detected in the analysis and the configuration of the hypothesis to be tested, there is not enough information to include relevant variables at the school level. Therefore, as only variables from the student levels are included in the model, single level regressions will be used as part of the SEM. The analysis of the Structural Equation Models was undertaken using the AMOS statistical software, version 17.0 (Arbuckle, 2008).

In this way the formal expression of the structural equation contains a set of both single-level linear regression and factor analysis equations. A single-level linear regression with one explanatory variable (e.g. individual resilience) can be formally expressed as follows:

$$y_i = \beta_0 + \beta_1 x_{1i} + e_i$$

where:

y_i is the score in the Mathematics or Language test obtained by the i^{th} student

β_0 is the estimated average score obtained by students in either test. It is also known as the great mean or the intercept.

β_1 is the estimated effect of the variable x_1 (*individual resilience*) over *y* (the score in the Mathematics or Language test).

x_{1i} is the value of the variable *individual resilience* for the student i^{th} student

e_{ij} is the deviation of the score obtained by the i^{th} student from the great mean. Also known as the residual which is assumed to be a random coefficient, normally distributed with mean = 0 and which variance (δ^2_e) will be estimated

In factor analysis, the main objective is to reduce the dimensionality of the explanatory variables by creating common factors that are not directly observable (i.e. postulating the existence of theoretical entities). In formal terms, such a model can be expressed as follows (Browne, 2009: 303):

$$y_{ir} = \sum_{j=1}^{J} \lambda_{rj} \eta_{ij} + e_{ir}$$

where:

y_{ir} is the r^{th} response for the i^{th} individual

η_{ij} is the j^{th} factor for the i^{th} individual

λ_{rj} is the coefficient (known as factor loading) for the r^{th} for the factor *j*

e_{ir} is the residual for the r^{th} response for the i^{th} individual

According to this, the full specification of the model would be a complex set of this kind of equations, with one equation for each relation postulated in the model. Fortunately, another of the advantages of SEM is a simplified model visualisation through its graphical modelling interface.

Several conventions are used in developing the diagrams that constitute this graphical modelling interface (Ullman, 2001: 654). Measured variables, also called observed or manifested variables are represented by rectangles. Factors or unobserved variables have two or more indicators and are represented by circles or ovals. Relationships between variables are indicated by lines with arrows; lack of a line between two variables means that no relationship has been hypothesized. A line with one arrow represents a hypothesized relationship between two variables, where the variable with the arrow pointing to is the dependent one. A line with an arrow at both ends represents an unanalysed relationship, i.e. a correlation between two variables with no implied direction. For the unidirectional hypothesized relationships (i.e. regressions), the residuals are represented with an “E” (i.e. error) for the observed variables, and with a “D” (i.e. disturbances) for the latent variables.

As explained above, a surprising data pattern expressed in the positive educational results obtained by an important proportion of students coming from a disadvantaged context in both Language and Mathematics has been detected; then, it was hypothesised that there are underlying mechanisms that, under certain circumstances (e.g. when they receive support from Oportunidades), would allow such individuals to overcome the constraints imposed to them by their habitus in order to systematically obtain positive educational results. It was further proposed that these underlying mechanisms can be characterised by a network of relationships among a set of individual and family factors that, in turn, form theoretical constructs denominated individual and family educational resilience.

To test the extent to which such an explanation fits the empirical data corresponding to the lower-secondary education in Mexico, six different structural equation models were constructed: three for Language and three for

Mathematics. For each subject, there is one model for each of the theoretical entities proposed (i.e. individual and family educational resilience) and one model including both variables simultaneously.

The models were tested in two sub-samples taken from the EXCALE dataset (INEE, 2006), one for Language and one for Mathematics. These sub-samples include students who: i) reported being in receipt of Oportunidades and ii) obtained a score above the national mean[38]. In this way, each sub-sample is constituted only by the students who meet these two characteristics. As mentioned before, the main purpose of this analysis is to test to what extent the theoretical model based on the resilience theory explains the underlying mechanisms that make it possible for a considerable number socially disadvantaged students, as characterised by Oportunidades, obtain educational results above the average.

In the diagrams of the models, the values associated with each relationship are standardised regression coefficients (for lines with one arrow) or correlation coefficients (for lines with two arrows) and are presented next to each line. These values represent the amount of change in the dependent variable (e.g. Language or Mathematics score), given a standard deviation change in the independent variable. Also, the coefficient presented next to each dependent variable (i.e. variables with an arrow pointing to them) corresponds to the amount of its variance that is explained by the independent (i.e. variable pointing to it), this coefficient is also known as r^2.

Finally, at the bottom of each diagram, two overall goodness-of-fit measures for the models are presented. Assessing the goodness-of-fit of structural equations models is not as straightforward as with other statistical techniques. There is not a single statistical test that best describes the fit of the model to the data; instead, different measures of goodness-of-fit can be used to evaluate the model from different perspectives (Hair, et al., 1999). For this work, the goodness-of-fit of the models is evaluated using a measure of absolute fit (Goodness-of-Fit Index) and a measure that compares the model proposed to a

[38] In the EXCALE datasets, the tests scores are presented in a scale from 200 to 800 units, with a mean centred in 500 points and a standard deviation of 100 units (Backhoff, et al., 2006). This scale was constructed using the Theory of Item Response with the Rasch Model (Cf. Rasch, 1960).

based or null model (Adjusted Goodness-of-Fit Index). Even when in the literature the Likelihood-Ratio Chi-Square Statistic is the most popular measure of overall fit, as pointed out by Hair and colleagues (1999), it has received important criticisms regarding its sensitivity to sample size differences, especially for cases with samples exceeding 200 respondents. Therefore, as the sample for the models analysed here is over 15,000 subjects it was decided not to use it.

Following Hair and colleagues (1999: 657), the goodness-of-fit index (GFI) correspond to the squared residuals from the proposed model compared with the actual data, but is not adjusted for the degrees of freedom. Its value ranges from 0 to 1, where values close to 0 represent a poof overall fit and 1 a perfect one. The adjusted goodness-of-fit index (AGFI) is an extension of GFI, adjusted by the ratio of degrees of freedom of the proposed model to the degrees of freedom of the null model. The authors recommend values greater than 0.90 as acceptable.

First, the models for Language are presented, initiating with separated models for individual and family resilience, followed by a model including both. Then, the same strategy is followed for the models for Mathematics.

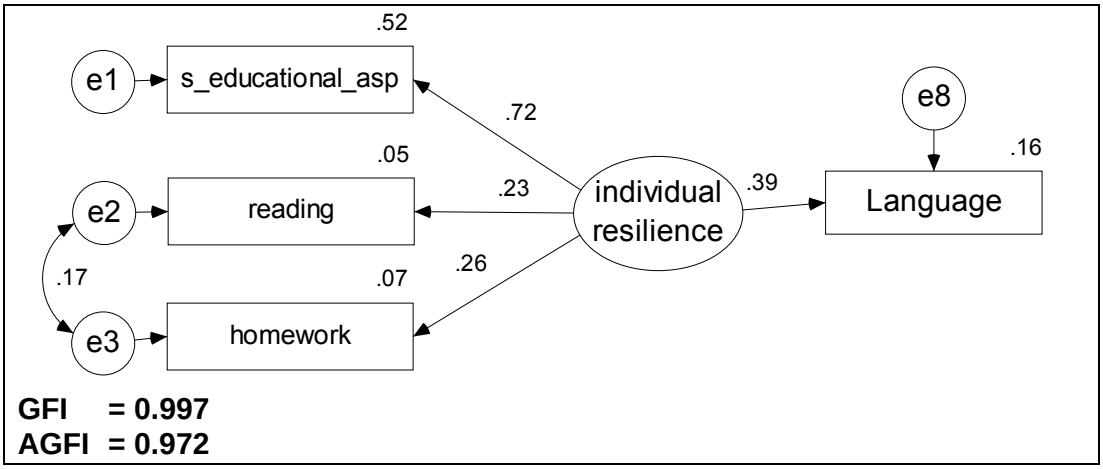


Figure 3. Individual educational resilience model for Language

Source: Own calculation based on a subsample of the EXCALE 2005 data sets (INEE, 2006) containing the students who reported to be enrolled in Oportunidades and obtained a score over 500 points
* All the coefficients are significant at the 0.05 level

In this model, based on the resilience theory as operationalised by Silas Casillas (2008), the existence of an unobservable theoretical entity denominated *individual educational resilience* is proposed as a part of a model to explain the unusually high performance of the students receiving support from Oportunidades in the Language test as reported in the EXCALE 2005 dataset (INEE, 2006). It has to be considered that even when Silas Casillas (Op cit), proposed two main dimensions in the individual resilience, namely self-confidence and effort, the detected data patterns only allowed me to operationalise the second one (as the reading and homework habits). Furthermore, even though Silas Casillas did not considered the students' educational aspirations in his study, this variable was included in the model as it is considered to be both an important element for motivation and evidence of the dispositions of the individuals towards education (e.g. the subjective value assigned to education as a vehicle for social mobility).

The goodness-of-fit of the model with the empirical data is acceptable, as the GFI and AGFI are quite close to 1. It can also be observed that the coefficient through which *individual resilience* explains the variation in the students' educational aspirations is rather strong and positive (0.72); moreover, the amount of variation that can be explained by this relationship is over the 50%. Regarding the students' reading and homework habits, the regression coefficients are also positive but not as strong as for the aspirations (0.23 and 0.26, respectively) and the proportions of their variance that can be explained by the independent variable are also very small, i.e. 0.05 for the first and 0.07 for the last. As would be expected there is a positive correlation between the homework and reading habits, though it is rather weak (0.17). Finally, the amount of change in terms of standard deviations that would be expected in the Language score given a change of one standard deviation in the *individual resilience* amounts 0.39, while the total amount of the variance in the scores that is explained by the model is 16%.

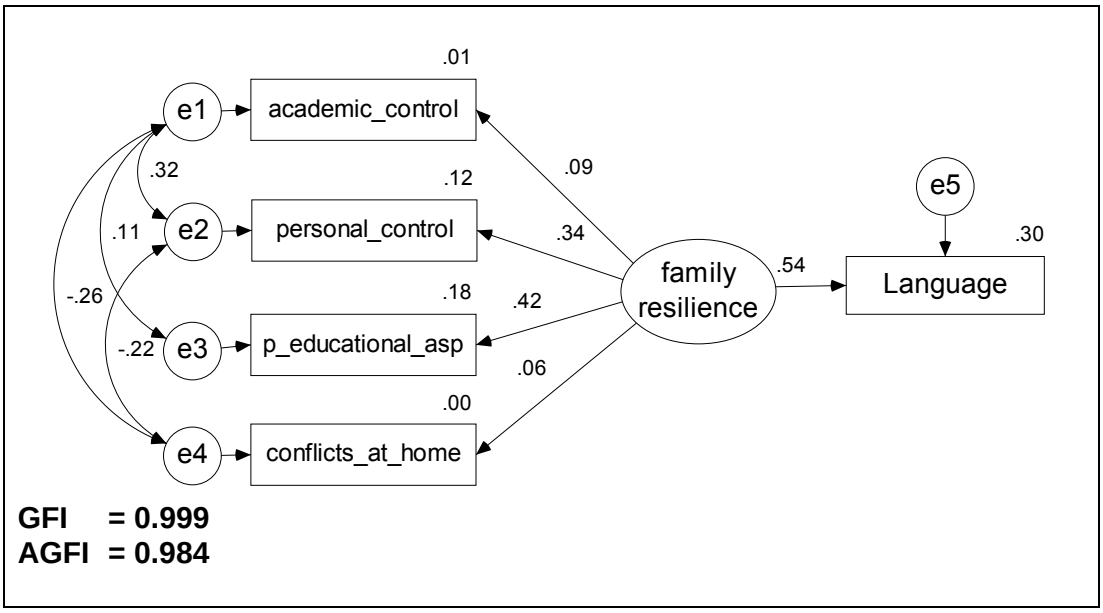


Figure 4. Family educational resilience model for Language

Source: Own calculation based on a subsample of the EXCALE 2005 data sets (INEE, 2006) containing the students who reported to be enrolled in Oportunidades and obtained a score over 500 points
* All the coefficients are significant at the 0.05 level

The model for family educational resilience explaining the variance of Language scores also showed a very good fit to the empirical data, as it can be observed both indexes of goodness-of-fit are very close to 1. About one third of the variance in Language scores can be explained by the *family resilience* (30%), and the weight of the resilience factor in terms of standard deviation amounts 0.54.

These encouraging coefficients could be related to the good match between the concepts of the Theory of Resilience and the empirical data included in the model. That is, the available empirical information allows for a better operationalisation of the theoretical concepts than in the individual resilience model. According to Silas Casillas, the *family educational resilience* has three dimensions: emotional support, economical or material support and example of resilience. The emotional support is well covered by the four variables included in the model; while the economic support is included by means of the sub-sampling strategy, i.e. all the families of the students in the dataset receive economic support conditional upon the regular attendance of their children at school. Unfortunately, the context questionnaires used for the analysis did not

count on empirical information about possible resilience examples around the students.

The regression coefficients of the *family resilience* factor that explain the four dependent variables are positive, though the coefficients for academic support and conflicts at home are very small (0.09 and 0.06, in that order) and the amount of variability in these variables that can be explained by the independent one is almost inexistent (0.008 and 0.004, respectively).

In contrast, *family resilience* explains considerable higher amounts of variance in the personal support strategies (0.12) and in the educational aspirations (0.18) that parents have for their children, while the weight of their regression coefficients is much more important as well (0.34 and 0.42, respectively).

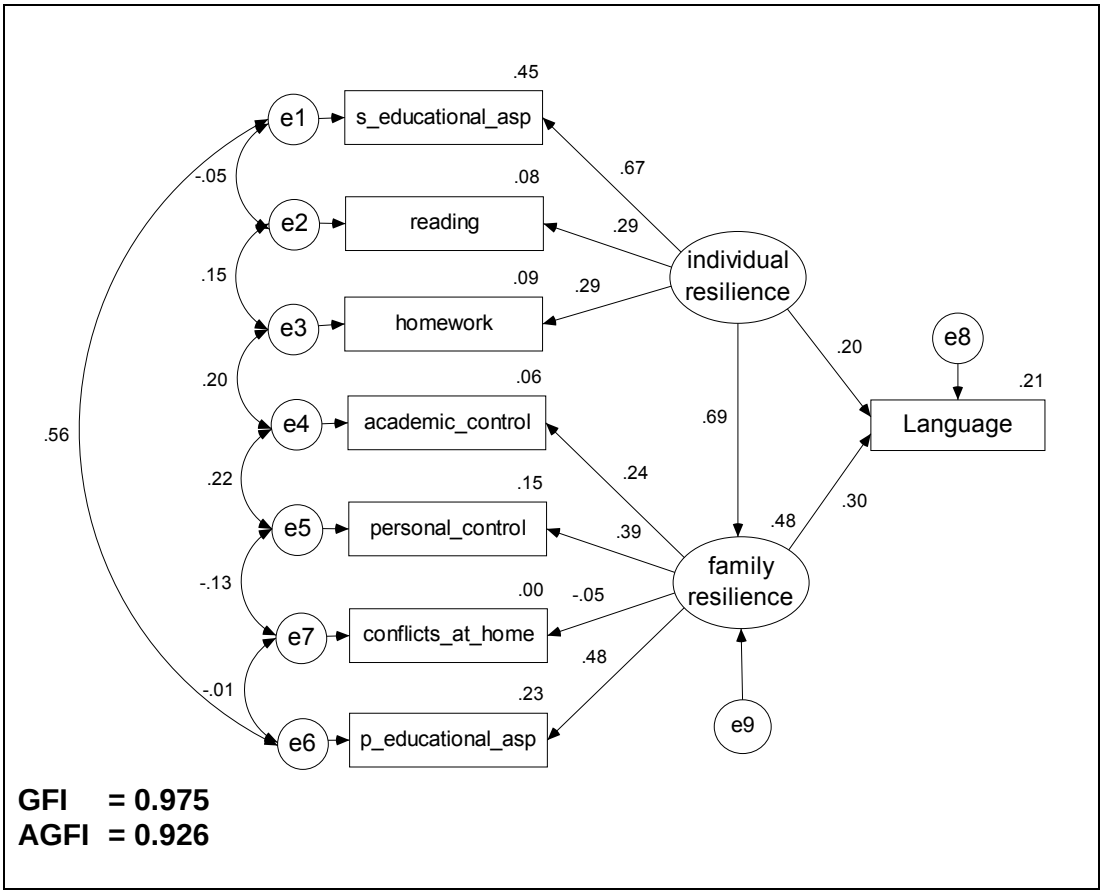


Figure 5. Total educational resilience model for Language

Source: Own calculation based on a subsample of the EXCALE 2005 data sets (INEE, 2006) containing the students who reported to be enrolled in Oportunidades and obtained a score over 500 points
* All the coefficients, but the covariance between e6 and e7, are significant at the 0.05 level

As can be seen in the figure above, in the model for *total resilience* in Language, the trends observed in the individual and family models are maintained. The goodness-of-fit of the model with the empirical data, even though a bit weaker is still good (GFI=0.975 and AGFI=0.926). As in the separated models, the variables better explained by the resilience factors are the students' educational aspirations (β=0.67 and r^2=0.45) for the individual dimension, and personal support (β=0.39 and r^2=0.15) and the parents' educational aspiration (β=0.48 and r^2=0.23) for the family dimension. According to the theory, there is a positive and strong relationship between the individual and the family dimensions of resilience, in which the individual resilience explains 48% of the variation in the family resilience with a regression weight of nearly three quarters of a standard deviation (0.69). Finally, the amount of the variance in the Language scores explained by the model amounts 22% and between the two dimensions of resilience considered, the family resilience shows a more important weight in its explanation.

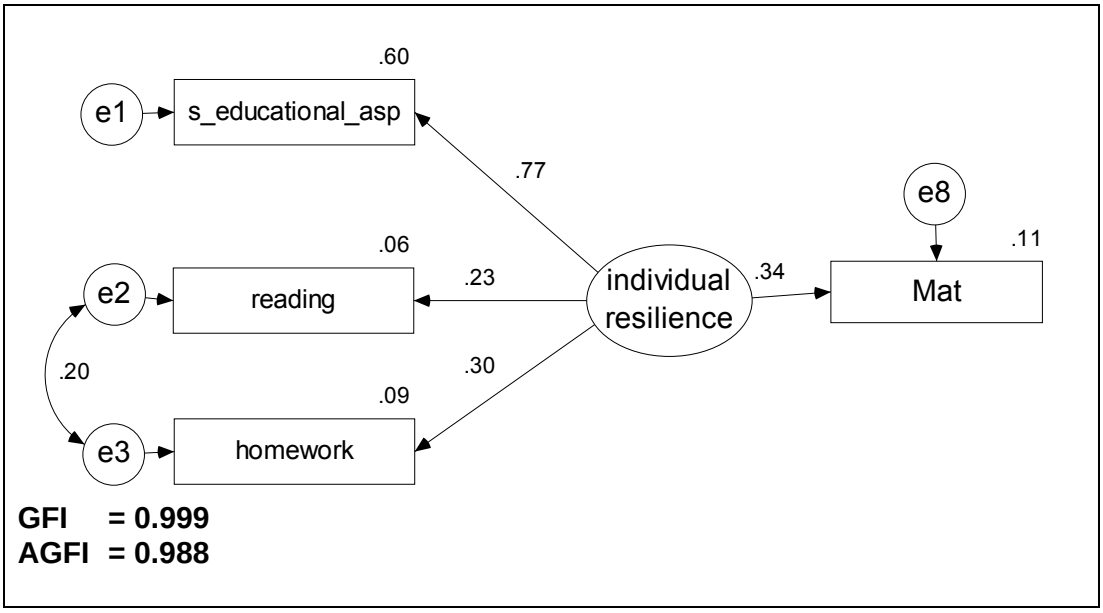


Figure 6. Individual educational resilience model for Mathematics

Source: Own calculation based on a subsample of the EXCALE 2005 data sets (INEE, 2006) containing the students who reported to be enrolled in Oportunidades and obtained a score over 500 points
* All the coefficients are significant at the 0.05 level

The results obtained for the Mathematics model are very similar to the ones showed by the Language model, the same relationships in terms of their direction and very similar magnitudes in the coefficient are observed. Just the

goodness-of-fit is slightly better and the amount of variance that can be explained Mathematics is a little smaller.

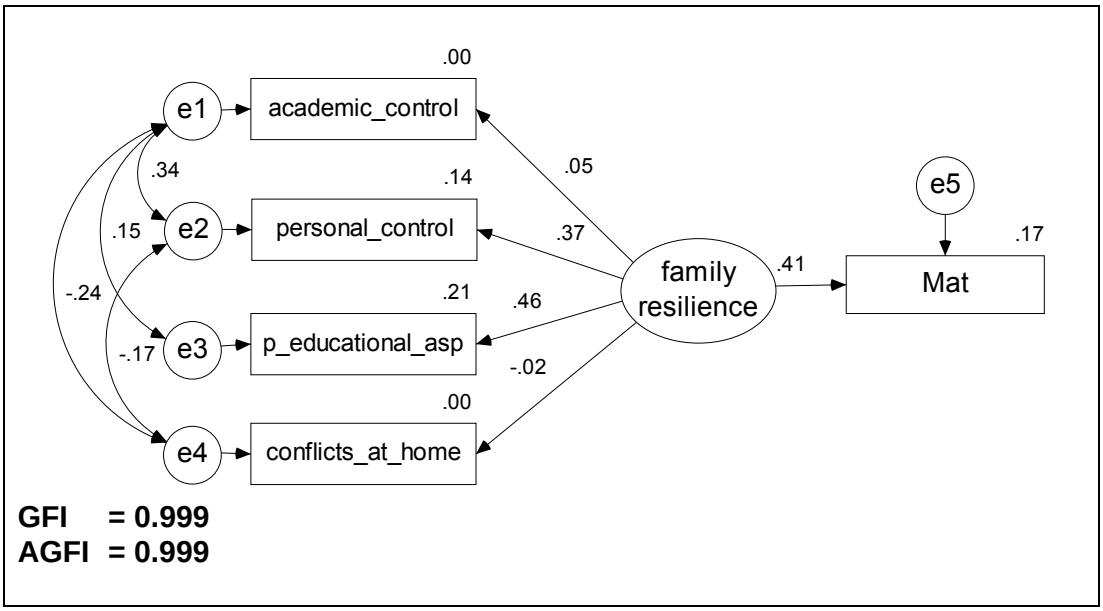


Figure 7. Family educational resilience model for Mathematics

Source: Own calculation based on a subsample of the EXCALE 2005 data sets (INEE, 2006) containing the students who reported to be enrolled in Oportunidades and obtained a score over 500 points
* All the coefficients are significant at the 0.05 level

It is practically the same case for the family resilience model in Mathematics; that is, the same relationships than in the equivalent Language model are observed, the GFI and AGFI are also slightly better and the amount of variance in the educational attainment is smaller than in Language too.

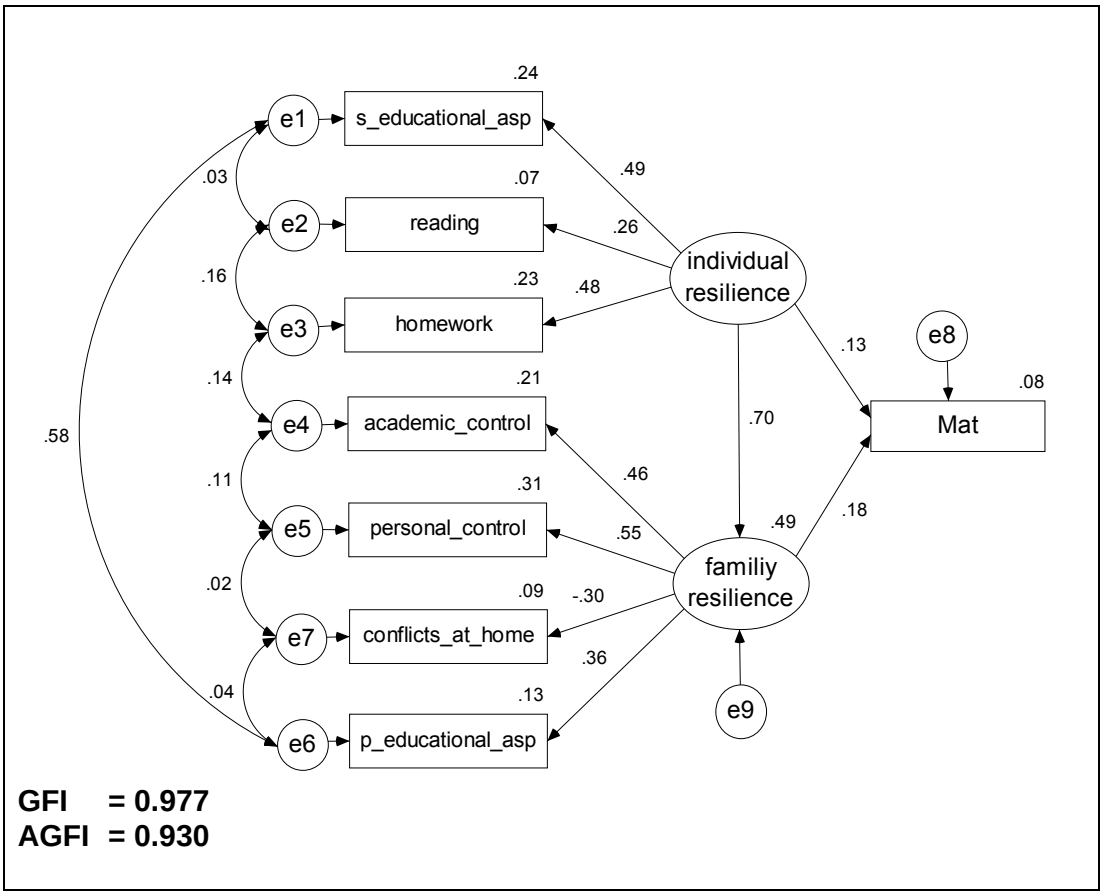


Figure 8. Total educational resilience model for Mathematics

Source: Own calculation based on a subsample of the EXCALE 2005 data sets (INEE, 2006) containing the students who reported to be enrolled in Oportunidades and obtained a score over 500 points
* All the coefficients, but the covariance between e6 and e7, are significant at the 0.05 level

Once again, the results of this model present remarkable similarities with its equivalent model for Language, and the same patterns in the relationship among the variables in the model are observed: the fit of the model with the empirical data is slightly better as shown by the goodness-of-fit indexes, and the variance in educational attainment explained by the set of proposed relationships is smaller than in the case of Language. The only noteworthy difference is that, in contrast to the model for Language, in this model the regression weight is slightly stronger for the family resilience than for the individual factor.

So, according to the results described above, there are elements to claim that the theoretical model proposed to explain the surprisingly positive educational results obtained by an important proportion of students coming from a disadvantaged context (i.e. receiving support from Oportunidades) fits well the

empirical data analysed. That is to say that there are grounds for thinking that the hypothesis (i.e. models) formulated based on the Theory of Resilience may be true for the Mexican lower-secondary context, and thus, is worthy of further pursuit.

It has to be remembered that at this phase of the analysis what we are dealing with is rudimentary theories that have initial plausibility. As an important part of the explanation provided the existence of hidden causal mechanisms was proposed (i.e. resilience), but the characterisation of their nature is still incipient. To move ahead of the rudimentary nature of these theories it is necessary to move to theory development.

6.2 Theory Development

As it was said before, the theoretical explanation generated in the last phase is rudimentary and dispositional in nature. It is, of course, not a fully developed theory that can be said to be ready to be evaluated against rival theories. In order to develop these rudimentary theories to that status, ATOM proposes the construction of analogical models of the causal mechanisms implicated in the theoretical explanations. The main objective is to increase the explanatory content of the theory, and to do this uses analogical abduction. Analogical abduction can be schematised as follows:

> Hypothesis H* about property Q was correct in situation S1.
>
> Situation S1 is like situation S2 in relevant respects.
>
> Therefore, an analogue of H* might be appropriate in situation S2.

In this case…

H* = Theory of educational resilience

Q = The surprisingly positive educational results obtained by an important proportion of students coming from a disadvantaged context

S1 = Surprising data pattern: Language and Mathematics scores above the average obtained by the students of the third year of lower-secondary education in Mexico who were beneficiaries of Oportunidades, as reported in the EXCALE 2005 datasets

S2 = Surprising data pattern: Students who continued studying after the compulsory education (upper-secondary education and onwards) and who lived in one of the most marginalised Mexican municipalities as classified by CONAPO (2001, 2006)

It is clear that in the two situations presented above there are important similarities in the aspects that are relevant for this research, namely i) both situations draw on a population of well performing students (i.e. in S1 students who obtained Language and Mathematics scores above the average, and in S2 students who remained in the education system after the compulsory education); ii) both situations draw on population of students from a disadvantaged context (i.e. in S1 as characterised by Oportunidades' selection of beneficiaries strategy, and in S2 according to the national indexes of marginalisation for municipalities); iii) both situations draw on the population of students finishing the compulsory education in Mexico.

Therefore, by analogy with the context used for the development of the Theory of Educational Resilience (TER), the hypothesis of the individual and family resilience, or an analogue one, might explain the differences in education achievement for the students who in spite of living in disadvantaged conditions

obtain scores above the average in the standardise tests applied by the national institutions for the evaluation of education.

The next step would be then to operationalise those dimensions of resilience proposed by the theory of educational resilience and not considered in the theoretical models developed above (i.e. school and community dimensions) in order to increase its explanatory content. However, as it has been said before, this is not possible given the results of the replication phases. In a strict fashion, before generating explicative models, data patterns have to be detected in the core analysis phase, confirmed by close replication and generalised by constructive replication. As explained in the replication phases, only very general data patterns could be generalised and therefore, in order to provide an example of the analysis strategy proposed for the theory development phase, the requisites of ATOM were taken in a non-strict fashion. For example, most of the data patterns incorporated in the explicative model have not reached the status of "generalised", rather they were "confirmed" and even in some cases only "detected" by the core analysis. I will come back to these and other empirical and theoretical limitations in the section of this thesis dedicated to conclusions.

Nevertheless, given the scarcity of studies that meet the characteristics needed to be candidates to be included in the replication phases, the data patterns presented in the sections above are the best available at the moment. Besides, the concurrence of the results of other recent theoretically driven studies (e.g. Blanco, 2007; Silas Casillas, 2008; Torres Cervantes, 2009) analysed here also gives support to the worthiness of pursuing the Theory of Educational Resilience in the theory development phase. In this way, further research will have to be carried out in order to obtain the theoretical building blocks that will make it possible to develop the Theory of Educational Resilience by increasing its explanatory content.

Finally, a similar path would need to be followed by other competing explanations in order to have fully developed rival theories to be evaluated in the final phase of ATOM: theory appraisal.

7. Conclusions

This thesis had two broad aims: the primary one was to develop a defensible Realist methodology that could be applied to school effectiveness research that was an advance on the empiricist methodology of SER and; by applying this methodology to a Mexican data base, to see what substantive claims could be made about equality and school effectiveness in Mexican education.

It has been argued that after almost 40 years SER has reached a point in which it is necessary to review and evaluate its fundamental assumptions in order to guarantee the accomplishment of the goals originally set for it. After a rapid and fruitful commencement, almost no new knowledge has been produced by this research programme in recent times (Hugh Lauder, et al., 1998). The situation of SER in Latin America, and especially in Mexico, gets even worse because of the scarcity of studies that, with a rigours and systematic methodology, address the topic (Blanco, 2008b).

However, over this time a prolific debate concerning the scope and limitations of this research programme has prompted researchers in the area to form at least three different and identifiable approaches to SER, namely: the traditional School Effectiveness Research programme (SER), a Realist Approach to School Effectiveness Research (RASER) and a Practitioners Approach to School Effectiveness Research (PASER). Each of them has different epistemological and ontological assumptions.

Consequently, the research question addressing this problem was: *Which research programme might provide the best way of understanding and taking forward school effectiveness research?*

In the Chapter 2, by using Lakatos' (1970) notion of research programmes, a rational reconstruction and a subsequent evaluation of these approaches was presented. The evaluation of these programmes revealed RASER as the most progressive in theoretical terms (i.e. the one which remains coherent between its hard core and protective belt and has the potential to eventually lead to novel

explanations). This is because it can postulate theories which address questions of power and other unobservable variables in a way that the Empiricist SER cannot. In turn, this opens the door for sociological theories like those of Bourideu, which cannot be understood without reference to unobservable concepts like *habitus* or *incorporated cultural capital*. When compared with PASER, RASER also showed to be more theoretically progressive because the phenomenological view presupposed by the first does not allow the agents to be aware of the underlying social structures which create the framework of power they work within. In contrast, under a Realist approach these structures are open to theoretical and empirical investigation to establish whether they exist or not and how they operate in educational settings.

Even when RASER proved to be the most theoretically progressive approach to school effectiveness research, its empirical progressiveness (i.e. the extent to which its theoretical explanations can be empirically corroborated) was still at stake, because most of the work developed under this programme so far has been theoretical. Before testing RASER's empirical progressiveness, *a* Realist methodology was needed. This challenge produced the next research question. That is, *to what extent is it possible to adopt or develop a Realist methodology within or as a part of the school effectiveness research programme?*

In chapter 3 a methodology designed to accompany RASER was developed. This methodology is based on the Abductive Theory of Scientific Method (ATOM) proposed by Haig (2005a) for the behavioural sciences. Different adaptations and developments were carried out in order to make ATOM operational in the context of SER, and the result, in very simple terms, was a methodological guide in two stages i) by systematically establishing the existence of contextually-based robust data patterns and ii) by constructing the subsequent explanatory theories.

In order to contextualise the application of this newly developed methodology, data to which the methodology could be applied was needed to be described and the variables to be involved to be theoretically justified.

Chapter 4 presents, in its first part, the main characteristics of the Quality and Achievement Examinations (EXCALE by its acronym in Spanish) and their accompanying context questionnaires developed and Applied by the Mexican National Institute for the Evaluation of Education (INEE by its acronym in Spanish). In the second part of the chapter, by following the tenets of Realism in linking theory to data, the different approaches that worked as theoretical underpinnings for the relationships between the independent and dependent variables were presented.

Following the methodology proposed, chapters 5 and 6 were dedicated to presenting the analysis of the empirical data. Each of these chapters was focused on one of the main stages of the methodology, i.e. the first on the establishment of the existence of contextually-based robust data patterns and the last on the construction of the subsequent explanatory theories. Combined they gave an answer to the question of t*o what extent the constructed explanatory theories can be operationalised within the proposed Critical Realist framework?*

Each stage of the analysis, and consequently each chapter, was guided by a set of analytical research questions. These analytical research questions organise the summary of the main results of chapters 5 and 6 presented below. The first four questions correspond to the results of chapter 5 and the fifth to the results of chapter 6.

What percentage of the variation in the educational achievements is due to differences between states, schools and students?

Among the levels considered in the analysis, the characteristics of the students constitute the group that explained the highest levels of variance in the educational results (between one half and almost three quarters). For the schools the levels of variance explained were around a third and for the states less than a tenth. These results were corroborated through its close and constructive replication, and therefore they can be said to be contextually-based robust data patterns for the lower-secondary education in Mexico.

More significantly, these results provide a map in which it is possible to identify the relative importance of the explanatory power of each of the variables involved in the analysis, and therefore the potential incidence of the interventions aimed at each level.

What characteristics of each level (i.e. schools, and students) have a significant effect on educational achievements?

In order to answer this question, multilevel models were carried out in which the dependent variables were the students' scores in the Language and Mathematics EXCALE tests and the dependent variables were a set of characteristics of the students and schools, incorporated and reported attending to theoretically related groups.

For the students' characteristics these groups are: i) Demographic characteristics, ii) Economic and cultural characteristics, iii) Family social capital, and iv) Opportunities to learn.

For the first group, being over the normative age showed to have a negative effect on the students' achievement in both subjects; while being a girl showed important negative effects over the students' scores in Mathematics only. In contrast, belonging to an indigenous group observed negative effects over the achievement in Language. As a result of the replication processes, with no contradictions and minor inconsistencies, these results can be considered as contextually-based data patterns.

The economic and cultural characteristics of the students are of central importance for this work, because of both their theoretical and empirical explanatory power. For this group of variables the first thing to point out is that, contrary to what was expected, the economic and cultural capital of the students (i.e. socioeconomic capital) did not show a direct effect on the educational achievement. Instead, this effect was observed through other variables closely related to it. This represents clear evidence of the complexity of the network of interactions taking place among the variables included in this group.

In this way, the variables showing significant effects over the students' educational achievement were: being beneficiary of the public policy programme known as Oportunidades, the amount of time spent by students working out of home in a remunerated activity, the students' educational aspirations, and their habits of reading and doing homework. All these variables showed a consistent behaviour across subjects, the first two in a negative way and the last three in a positive one.

The close and constructive replication of these results was not consistent in a detailed fashion. In other words, the other works included in the replication phases did not show significant effects for most of the specific variables included in the analysis carried out in this research. However this can be explained by the fact that most of these studies did not include these specific variables in their analysis, instead they included the more general concept of socioeconomic status (operationalised in very different ways, though). In any case, for this and the other studies considered in the replication, the economic and cultural characteristics of the students are the most powerful theoretical group in explaining the variance in educational achievement. For that reason, it is not safe to talk about contextually-based data patterns at the level of variables, but it can be done at the level of the theoretically related group of variables.

For the group of variables measuring the social capital in the family significant and negative effects on the educational attainment were found for: students who live with both of their parents, for the academic support provided by the family and for the magnitude and length of the conflicts at home. Positive effects were found for the personal support provided by the parents, the parents' educational aspirations for their children and for the students' consumption of alcoholic beverages and tobacco.

Because according to the social capital theory, their behaviour should be exactly the opposite, two results in this group are surprising, i.e. the positive effect of the consumption of alcohol and tobacco and the negative effect of living with both parents. Three possible explanations can be adventured for

such a contradictory result, the first is related to probable inaccuracies in the operationalisation of the respective variables, the second to a bad fit between the theory and the empirical data, and the third to a possible spurious correlation originated from a technical deficiency of the model or a limitation of the statistical technique in itself. Any of the three options could provide a total explanation of the result in question or the three of them could explain it in a partial way. In any case the three of them are constrained by the impossibility of fairly distributing the praise and the blame in complex statistical models like the one is being analysed here, and therefore further investigation of the issue is recommended.

Regarding the behaviour of these variables in the replication process, a similar analysis to the one developed for the economic and cultural characteristics of the students can be done here. For the variables measuring the social capital in the family no contextually-based data patterns could be established, and one of the possible explanations responds to the fact that these specific variables were not included in the other studies. However, their theoretical importance and the interesting relationships that these variables establish with the economic and cultural characteristics of the students (I will come back to this point) invite to further investigation.

The last group of variables at the student level corresponds to the physical and emotional conditions affecting the students' opportunities to learn, i.e. the students' absences, the teachers' absences, the availability of text books, the students' participation in housework, and whether they are victims of bullying. All the variables in this group showed significant effects on the students' attainment. However, contrary to what was expected according to the theoretical framework, the students' absences and their participation in the housework showed positive effects on the attainment.

Alternative explanations were provided in each case, i.e. a positive and significant correlation with the socioeconomic capital for the first; and the possibility that the students' participation in the housework is not as good as a proxy measure for the time available for school, as it is for the kind of relationship among the members of the family. Nevertheless, it is important to

remember that such alternative explanations are always constrained by the impossibility to distribute the praise and the blame between the theory, its operationalisation and the statistical analysis utilised. Furthermore, the nonappearance of these variables in the other studies also impeded the establishment of contextually-based data patterns and, at the same time, call for their further investigation.

For the schools' characteristics the theoretically related groups organising the variables at this level are: i) School composition, ii) School resources, iii) School climate, iv) School management, and v) Opportunities to learn. The explanatory variables included in this level correspond to three different sources: the context questionnaires applied to head-teachers, and school aggregated information from the context questionnaires applied to teachers and to students.

The first thing to notice about the school level variables as a whole is that in comparison to the student level variables, they have a considerably smaller capacity to explain the differences in the student attainment. Furthermore, many of the relationships hypothesised according to the theoretical framework did not show significant coefficients, specially the non-aggregated variables (i.e. the variables created with information from the teachers' and head-teachers' context questionnaires). As mentioned before, this could have at least three different explanations: inadequacy of the theoretical framework to the empirical data, inaccuracies in the operationalisation of the theoretical framework (this could be an explicit or an impregnated one), and/or technical limitations related to the modelling strategy and/or the statistical technique in itself. In any case, this results show the importance of keep on working in the development of theory driven instruments that allow the collection of information that gives a better account of the school and classroom factors and processes that explain the differences in student attainment.

Now, from the first group of variables, namely the characteristics of the school composition, the following variables showed a positive and significant relationship to the student attainment in both Language and Mathematics: the school aggregated socioeconomic capital, the school aggregated students' educational aspirations, if the school is a telesecundaria and if the school is

private (the last two variables are interpreted with the general schools as a reference). The variables with a negative and significant coefficient were: the average of students older than the normative age and the average of students carrying out a paid job. In general terms it can be said that this results fit well the theoretical framework proposed, that is schools with low proportion of students over the normative age and carrying out a paid job; and with high levels of socioeconomic composition and student's educational aspirations, contribute to produce a institutional *habitus* that is favourable for the learning achievement of their students.

Among these variables, the one that showed higher consistence across the replication phases was the socioeconomic composition of the school (i.e. the school average of the economic and cultural characteristics of the students), however it has to be pointed out that the operationalisation of this variable varies considerably across the studies used in the comparisons.

In general terms, there is good consistence between the results of this work and the other studies used for the replication phases. So, it can be said that there is a contextually-based empirical data pattern regarding the effect of the school composition on the educational attainment of the Mexican students in lower-secondary education. Form the school composition variables found to have a significant effect in this study, all of them (except for the educational aspirations) were successfully closely replicated and all of them were confirmed by at least one of the studies included in the constructive replication.

The second group of variables at the school level, i.e. school resources, was formed by fifteen variables divided into three sub-groups, namely school infrastructure and equipment, characteristics of the human resources in the school, and the time teachers and head-teachers have available to dedicate to school related activities. From these variables only three, one of each subgroup, were found to have significant effects on the school outcomes. In this way, the amount of training taken by the teachers and the availability and conditions of infrastructure and equipment in schools showed a positive effect, while the teachers' limited availability of time for school related activities (due teachers having other paid job) showed a negative effect. Even though these results

concur to the theoretical framework (i.e. higher levels of resources are related to higher educational achievement), it is important to point out, on the one hand that most of the variables originally considered did not show significant effects on the school outcomes, and on the other that the operationalisation of the variables in this group is not consistent across studies (i.e. most of these variables correspond to indexes and the single items forming them vary across studies, although they all can be said to be measuring the same dimension).

For the first two variables, the existence of contextually based data patterns was established through the close and constructive replication phases. The case of the schools infrastructure and equipment is especially interesting because it provides evidence of the importance of the context in the establishment of data patterns. That is because contrary to the empirical evidence found in developed countries, for the Mexican case these physical resources do have a positive effect on the educational attainment.

The third group of theoretically related variables corresponds to the variables measuring the school climate. In this group, from the nine variables originally considered only head-teachers' perception on the parent's involvement in the school activities showed significant (positive) effects on the students' achievement, and only for the Language scores. Whether it is because of the vagueness of the concept, a deficient operationalisation of the theory underlying it or precisely because the lack of an explicit theory, these results make it clear that the empirical information available has important limitations for giving an accurate account of the concept. This combined with the fact that school climate is regarded as one of the most important concepts for SER, points towards the need of producing information with enough detail to develop a sound context-based theoretical framework to analyse the concept.

The fourth group of theoretically related variables refers to the head-teachers' statements about their school management practices. None of the variables included here observed significant effects on the educational attainment. Similarly to the school climate concept, in SER, different managerial strategies have been found to have an important role in the explanation of the variation in educational attainment. Therefore, this result also points out the importance of

working in the development of a sound theoretical framework that makes it possible to collect reliable context-based empirical information regarding school management characteristics.

The last group is formed by the variables exploring the opportunities to learn at the school level. From the variables included in this group only the proportion of homework reviewed and commented by the teachers had a significant, and positive, effect on the school outcomes. Regarding the other variables, similar explanations than for the last two groups can be hypothesised, and similar conclusions can be drawn: the lack of a sound context-based theoretical framework makes it difficult to count on consistent information across studies, and thus the replication of their results and the subsequent establishment of data patterns becomes very complex task.

Do the effects of these factors remain constant across different socio-economic and cultural contexts?

To answer this question the focus of the analysis moves to the interaction terms included in the multilevel models described above. Specifically, these interaction terms analyse the relationship between an independent variable (i.e. one of the student level variables included in the demographic, socioeconomic and social capital theoretically related groups) and the independent variable (i.e. Language or Mathematics scores in the EXCALE), depending on the particular level of another independent variable (i.e. the socioeconomic composition of the school). So, in this work the coefficients of the interaction terms make it is possible to analyse the effect of the demographic, economic, cultural and social characteristics of the students on their educational attainment, depending on the level of the socioeconomic composition of the school.

A general conclusion of this analysis is that students in schools with higher socioeconomic composition would be more sensible to the effect of the demographic, economic, cultural and social variables. That is to say that the lower the socioeconomic composition of the school, the less the potential benefit of improving the economic, cultural, social contexts of the students (e.g.

reducing child labour rates, becoming beneficiary of Oportunidades, increasing educational aspirations, improving reading and homework habits, etc.).

In other words, this suggests that schools with higher socioeconomic compositions are better equipped to take advantage of policies aiming to improve the contextual conditions of their intake (e.g. compensatory programmes focused on the intake).

These results are in line with the hypothesis of the *organisational habitus* and therefore constrain the optimism generated by the direct effects of the variables related to the cultural and social capital in the family. For example the positive effects on educational attainment found for variables like educational aspirations, reading and homework habits, or the personal support in the family, have to be interpreted with caution as all these effects are highly correlated to the socioeconomic composition of schools.

From the works considered in the close and constructive reconstruction phases only the one carried out by Blanco (2007) included interaction terms in its analysis. Based on the comparison with this work, empirical patterns regarding the interaction between socioeconomic factors and if the students work out of home, their reading habits and the personal support they receive within their family can be said to be confirmed. However, because of the lack of other studies including this kind of analysis, the establishment of context-based empirical patterns could not be reached.

Do the effects of these factors on educational achievements differ across schools? In other words, are there some schools more equitable than others in terms the characteristics evaluated?

To answer this question, the multilevel models described above, i.e. fixed slope models (where the effect of the independent variables on the students' attainment was assumed to be the same for all schools) were extended in order to allow for possible different effects of the independent variables for each school, i.e. random slope models. Differences between fixed and random slope

models were tested for the variables considered theoretically relevant in explaining socioeconomic (in)equalities. A significant difference between these two models means that the effect of the variable that is being tested varies across schools, in other words that there are some schools more (in)equitable than others regarding the effect of this particular variable.

Differences across schools were found for the participation of students in Oportunidades, if the students work out of home in a remunerated activity, the students' educational aspirations and their reading habits. In this way, it can be said, for example, that the lower-secondary Mexican schools differ in their ability to compensate, in terms of educational achievement, for the socioeconomic disadvantages that the beneficiaries of Oportunidades bring with them to school; or that the lower-secondary Mexican schools differ in their ability to take advantage of the high educational aspirations of their students to boost their educational results.

Regarding the replication of these results, again, the only study that dedicates part of its analysis to answer a similar question is the one carried out by Blanco (2007). Though, contrary to this work, Blanco focused his analysis on the school processes (mostly variables at the school level) rather than in the socioeconomic characteristics of the students (variables at the student level). However, both works coincide that schools vary in their capacity to compensate for the negative effect of working on the educational attainment of their students.

In general terms, it can be said that there are elements that suggest the existence of contextually base data patterns regarding the variation in the ability of the lower-secondary Mexican schools to compensate, in terms of educational achievement, for the socioeconomic disadvantages of their students. In other words, it can be said that the way in which the Mexican lower-secondary schools receive and treat the students with socioeconomic disadvantages varies in a significant way.

The next analytical question is then concerned with providing theoretical explanations for these (in)equity patterns.

What theoretical models can be proposed to explain the inequity patterns in the distribution of educational achievements?

The last four analytical questions were focused on the detection and establishment of context based empirical data patterns (i.e. first stage of the methodology proposed), and as a result it was found that there are schools that compensate better for the structural disadvantages of their students than others; that is, there are schools more equitable than others. Furthermore, specific mechanisms associated to specific variables were pointed out. Because it would not be possible, in this work, to postulate theoretical explanations for all of them it was decided, based on practical, theoretical and empirical arguments, to use the variable indicating whether the students' families are beneficiaries of Oportunidades as an example to carry out with the second stage of the methodology proposed, that is theory construction.

Oportunidades represents a good option because it was one of the variables for which schools differ in their ability to compensate for students' socioeconomic disadvantages. This suggested that something could be done at the school level to improve the way in which these students are treated in order to enhance their educational attainment. Furthermore, an analysis of the behaviour of this variable revealed that, under certain circumstances, socially disadvantaged students, as characterised by Oportunidades, could obtain similar or even better educational results that their peers in better social positions.

The next step was then to postulate a theoretical explanation for this surprising pattern. After analysing the merits of the theories available, it was decided to develop an explanatory model based on the Theory of Resilience (Silas Casillas, 2008). By making use of existential abduction the explanatory model proposed postulated the existence of unobservable theoretical entities (i.e. individual and family resilience) that played a significant role in the explanation of mechanisms underlying the corresponding data pattern.

In order to test the proposed explanatory model structural equation models were employed. This statistical technique was considered the most suitable

because (concurring to the Critical Realist approach) one of its main characteristics is that both dependent and independent variables can be either observed or unobserved variables. Furthermore, it provides a measure of goodness-of-fit which can be thought of like a measure of the extent to which the theoretical model proposed fit or is true for the empirical data.

Six different structural equation models were constructed and tested: three for Language and three for Mathematics. For each subject, there is one model for each of the theoretical entities proposed (i.e. individual and family educational resilience) and one model including both variables simultaneously.

The results of these analyses suggest that the explanatory models fit well the empirical data, and therefore may be true for the Mexican lower-secondary context, and thus, the Theory of Resilience is worthy of further pursuit.

These results opened the door for the next phase of the methodology: Theory Development. At this point the explanatory model proposed to explain the data patterns detected are rudimentary and dispositional in nature, and are not ready to be evaluated against rival theories; hence, they need to be developed (i.e. to increase the explanatory content of the theory). The method proposed for the development of theories is the construction of analogical models of the causal mechanisms implicated in the theoretical explanations.

In this way, after evaluating the similarities between the context in which the Theory of Educational Resilience was developed and the context in which this work is situated, it is proposed to increase the explanatory content of the models by analogical abduction.

That is, it is suggested to operationalise those dimensions of resilience proposed by the theory of educational resilience that are not considered in the theoretical models tested (i.e. school and community dimensions). These dimensions were not originally considered as there is not empirical information available.

This research makes a contribution in at least three main areas: a proposal of a scientific methodology to enhance the progressiveness of SER, developments in theory construction to explain contextually-based data patterns and mechanisms of reproduction of educational inequalities and, as a logical consequence, bases for the formulation of better informed public policy strategies. Of course, along these contributions there are several limitations that constraint the scope of this thesis.

Scope and limitations

In order to judge more accurately the scope of the methodological, theoretical and political implications of this thesis, it is important to consider its main limitations. The limitations of this research have to be analysed at two different levels. The first corresponds to the main objective of the thesis: the development and application of a Realist methodology to School Effectiveness Research. The second level has to do with the problems faced during the analysis of the empirical data. These problems –that are mainly related to the characteristics and the quality of the information available, and the strategies followed to overcome them are described in the sections focused on the data analysis (see chapters 5 and 6). However, a further issue concerns the degree to which complex Realist theories such as those of Bernstein and Bourdieu can be satisfactorily operationalised. It will be seen from the earlier chapters that how the data are grouped (see Chapter 4) will depend upon pragmatic decisions with respect to the data available. What is clear is that such considerations may limit the way that, for example, Bourdieu's notions of cultural capital can be operationalised. The limitations regarding the application of the methodology proposed are discussed next.

Even when I tried to adhere strictly to the methodology proposed it was not always feasible. Specifically, it was not possible to carry on with the Theory Appraisal phase. The reason is that there are no other theories within SER developed in the terms proposed by Haig (2005a) that could be used for the comparison. That is, as the main objective of this phase is to assess empirical adequacy of competing theories, it would have been necessary to have other theories to compare with.

Additionally, as mentioned in the chapter dedicated to the Theory Construction stage (chapter 6), based on the results of the structural equation models, one of the conclusions of the Theory Development phase was that the Theory of Educational Resilience (TER) is worth pursuing –however, it has to be remembered that at this stage this theory is still considered as dispositional (i.e. temporally rooted to a set of particular dispositions, and thus not fully developed and definitive). The next step would be to operationalise those dimensions of resilience proposed by TER and not considered in the models tested in chapter 6. The best way to do this would be through a complementary data collection process by qualitative means in order to develop a complete model and subsequently test it via structural equation modelling. Due to time and budget constraints it was decided not to do this. Nevertheless, as it can be judged by the analysis of the results obtained, it is considered that the application of the methodology proposed has the potential to advance school effectiveness research by making it possible to develop more adequate theories to explain the reproduction of educational inequalities and, as a consequence, the formulation of better informed policy and intervention strategies.

Methodological implications

As it has been pointed out in the previous chapters, the main criticisms of the mainstream of SER can be grouped in: i) its lack of theoretical basis in both, the selection, operationalisation and explanation of the relationships between the variables it uses; and for supporting its fundamental assumptions regarding the nature of schools, students and teachers (Sandoval-Hernández, 2008); ii) a mechanicistic approach for explaining the relationship between school attainment and its associated factors; and iii) a de-contextualised application of its findings.

It has been also suggested that a Critical Realist approach can provide a framework to develop a methodology for the construction of the theories needed to overcome the first two criticisms. Furthermore, the pertinence of a methodological approach based on ATOM (Haig, 2005a) has been also suggested by showing that it shares the ontological and epistemological

commitments of the Critical Realist paradigm. Even more, when focusing on the identification of contextually-based data patterns instead of phenomena, the methodology proposed take explicit account of the third criticism.

This is how, drawing on a Critical Realist perspective, the series of strategies and sub-methods brought together by the methodological proposal of this work represent a coherent theory of scientific method that provides a systematic guideline to unveil the existence of contextually-based robust patterns and to develop the theories to explain them.

Theory implications

In a first instance, this work makes a contribution to identify and establish those factors that have an influence in the school outcomes in the lower-secondary education in Mexico. Even when in the developed countries SER has been working in this line for several decades now, in Mexico the available research is scarce and its results are no systematically produced (Blanco, 2007), furthermore the Mexican literature on the topic shows that very limited attention has been given to the lower-secondary level.

Starting from there, this work contributes towards two theoretical aspects:

i) The relationship between the student's cultural and socioeconomic characteristics and their school outcomes. To explore this relationship three approaches are considered in this work: the reproduction theories (Bernstein, 1975; Bourdieu, 1977), the rational choice theory (Boudon, 1974) and the social capital theories (Bourdieu, 1983; James S Coleman, 1988; Putnam, 1995). Along these lines, special attention is given to the possible interaction between the elements of these theories in order to explain the long-tested relationship between socio-cultural origin and school attainment. These interactions are approached as mechanisms underlying the phenomena observed on the surface and establish links and a coherent structure for the explanations given by the different theories.

ii) The relationship between schools characteristics and school outcomes. At the school level, although there are no solid, overarching theories to explain the differences in school outcomes, a systematized analysis of the available literature allows identifying that the main approaches focus on: the role of the sociocultural and economic context; economic, material and human resources; school leadership and school management; school climate and learning environment; and pedagogic practices. Once again, this work explores the interactions among these elements and the ones described above in order to produce the first building blocks for a theory that explains the variations in school outcomes. Special emphasis is given to the identification of the mechanisms through which schools transform the social inequalities in educational inequalities.

Policy implications

In the last decades, the Mexican public policy in education has been focused in achieving two main objectives: increment of coverage and decrement of inequalities (principally measured by the scores in standardised tests). Data provided by the SEP, reveals that there has been considerable progress in the achievement of the first objective. In fact, education coverage in Mexico shows continuous growth. For example, the rate of coverage for lower secondary education went from 66.1% in 1991-1992 school year, to 92.5% in the 2005-2006 period.

However, despite these remarkable achievements and in a way because of them, inequities within the educational system have prevailed. When large sectors of the most marginalised population (that accounts for most of the increment in the coverage rate) were incorporated into the education system, the inequalities in school attainment became more intense and more evident. Research produced by authors like Muñoz-Izquierdo and Villarreal (2005) and Sandoval-Hernandez and Muñoz-Izquierdo (2004) have showed that these inequalities remain –and tend to grow– despite the compensatory programmes implemented by the government. Along these lines, some authors (e.g. Blanco, 2007) suggest that the failure of these compensatory strategies might be related

to the contrast between their homogeneity and the heterogeneity of the Mexican schools in terms of their social and geographical context.

On this scenario, the results of this work provide elements for the design of contextual policy strategies considering the following elements: i) an exploration of the effects of specific compensatory programmes on the (in)equity patterns identified across schools with different socioeconomic and cultural characteristics; ii) an empirical analysis of the validity of the ontological assumptions on which these programmes are designed; and iii) the development of theoretical explanations that allow a better understanding of the mechanisms through which these inequity patterns occur.

If the mechanisms underlying these (in)qualities can be disentangled and explained with a sound theoretical support, there will be firm elements to redesign the policy initiatives related to them or to design complementary ones. The explanation of the educational (in)equity patterns proposed by the models based on the Theory of Educational Resilience represent a first step in this direction. Furthermore, the scientific methodology proposed provides the tools for continuing this work.

References

Aitkin, M., & Longfort, N. (1986). Statistical modelling issues in school effectiveness. *Journal of the Royal Statistical Society, 1 - 43*(1), 149.

Alexander, K. L., Fennessey, J., McDill, E. L., & D'amico, R. J. (1979). School SES influences -- Composition or Context? *Sociology of Education, 52*, 222-237.

Arbuckle, J. L. (2008). Amos (Version 17.0.0). Crawfordville, FL: Amos Development Corporation.

Atherton, J. S. (2008). Language Codes. Retrieved 18June 2009, 2009, from http://www.doceo.co.uk/background/language_codes.htm

Backhoff, E., Andrade, E., Sanchez, A., Peon, M., Bouzas, A., Santos, A., et al. (2006). *El aprendizaje del Español y las Matemáticas en la educación básica en México*. México: Instituto Nacional para la Evaluación de la Educación.

Backhoff, E., Bouzas, A., Contreras, C., Hernández, E., & García, M. (2007). *Factores escolares y aprendizaje en Mexico. El caso de la educacion basica*. Mexico: INEE.

Backhoff, E., Sánchez, A., Peón, M., Montoy, L., & Tanamachi, M. d. L. (2006). Design and development of examinations of educational achievement and quality. *Revista Mexicana de Investigacion Educativa, 11*(29).

Backhoff Escudero, E., Bouzas Riaño, A., Hernández Padilla, E., & García Pacheco, M. (2007). *Aprendizaje y desigualdad social en México. Implicaciones de política educativa en el nivel básico*. Mexico: INEE.

Backhoff Escudero, E., Peon, M., Andrade, E., & Gonzalez, S. (2006). *El aprendizaje de la expresion escrita en la educacion basica en Mexico: sexto de primaria y tercero de secundaria*. Mexico: Instituto Nacional para la Evaluacion de la Educacion.

Balarin, M. (2008). Post-structuralism, realism and the question of knowledge in educational sociology: a Derridian critique of social realism in education. *Policy Futures in Education, 6*(4).

Ball, S. (1998a). Educational studies, policy enterpreneurship and social theory. In R. Slee, G. Weiner & S. Tomlinson (Eds.), *School effectiveness for whom? Challenges to the school effectivenes and school improvement movements* (pp. 70 -83). London: Falmer Press.

Ball, S. (1998b). Good school / Bad school. Paradox and fabrication. *British Journal of Sociology of Education, 18*(3), 337-336.

Banicky, L. A. (2000). Opportunity to learn. *Education Policy Briefs, 7*. Retrieved from

http://dspace.udel.edu:8080/dspace/bitstream/19716/2446/1/opp%20to%20learn.pdf

Bar, A. (2001). Abduccion. La inferencvia del descubrimiento. *Cinta de Moebio*(12), 1 - 7.

Barbosa, M. L. d. O., & Fernandes, C. (2001). A escola brasileira faz diferença? Uma investigação dos efeitos da escola na proficiência em Matemática dos alunos da 4a série. In C. Franco (Ed.), *Promoção, ciclos e avaliação educacional* (pp. 155- 172). Porto Alegre: Artmed.

Barone, C. (2006). Cultural Capital, Ambition and the Explanation of Inequalities in Learning Outcomes: A Comparative Analysis. *Sociology, 40*(6), 1039–1058.

Barrón-Pastor, J. C. (2006). *Constructing problems and solutions for indigenous peoples: A Critical discourse analysis about identity and cultural violence in Mexican main political platforms.* Unpublished Master of Research in Development Studies, University of East Anglia, Norwich.

Barrón-Pastor, J. C. (2007). *Promoting intercultural relations? Racism and Affirmative actions for Indigenous persons in Mexican Higher Education*. Paper presented at the Society for Latin American Studies Conference 2007. Retrieved from http://juanchobarron.googlepages.com

Becker, R. (2003). Educational expansion and persistent inequalities in Germany. *European Sociological Review, 19*, 1-24.

Bell, J. F. (2001). Visualising multilevel models: the Initial Analysis of Data. Retrieved 07 February 2008, 2008, from http://www.cambridgeassessment.org.uk/ca/digitalAssets/113877_Visualising_Multilevel_Models._The_Initial_Analysis_of_Data.pdf

Bennett, N. (2001). Power, structure and culture: an organizational view of school effectiveness and school improvement. In A. Harris & N. Bennett (Eds.), *School Effectiveness and School Improvement: alternative perspectives*. London & New York: Continuum.

Bernstein, B. (1971). *Class, Codes and Control* (Vol. 1). London: Routledge and Kegan Paul.

Bernstein, B. (1975). *Class, Codes and Control* (Vol. 3). London: Routledge and Kegan Paul.

Bhabha, H. (1994). *The location of culture*. New York: Routledge.

Bhaskar, R. (1979). *The Possibility of Naturalism. A philosophical critique of the contemporary Human Sciences.* Brighton, Sussex: The Harvester Press.

Blanco, E. (2007). *Eficacia Escolar en Mexico. Factores escolares asociados a los aprendizajes en la educacion primaria.* Unpublished doctorate thesis, Facultad Latinoamericana de Ciencias Sociales, Mexico.

Blanco, E. (2008a). Factores escolares asociadoa a los aprendizajes en la educacion primaria mexicana: Un analisis multinivel. *Revista Electrónica Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 6*(1), 58-84.

Blanco, E. (2008b). Factores escolares asociados a los aprendizajes en la educación primaria mexicana: un análisis multinivel. *Revista Electrónica Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 6*(1), 58-84.

Bogen, J., & Woodward, J. (1998). Saving the Phenomena. *Philosophical Review, 97*, 303-352.

Bond, T., & Fox, C. (2001). *Applying the Rasch Model*. London, Mahwah, New Jersey: Lawrence Erlbaum Associates.

Bosker, R., & Visscher, A. (1999). Linking school management theory to school effectiveness research. In A. Visscher (Ed.), *Managing schools towards high performance* (pp. pp. 291-322). Lisse, The Netherlands: Swets & Zeitlinger.

Boudon, R. (1974). *Education, opportunity and social inequality*. New York: John Willey.

Boulton, M. J., & Underwood, K. (1992). Bully/victim problems among middle school children. *The British Journal of Educational Psychology, 62*(1), 73-87.

Bourdieu, P. (1977). *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.

Bourdieu, P. (1983). Forms of capital. In J. C. Richards (Ed.), *Handbook of Theory and Research for the Sociology of Education*. New York: Greenwood Press.

Bourdieu, P. (1990a). *In other words: essays towards a refexive sociology*. Cambridge: Polity Press.

Bourdieu, P. (1990b). *The logic of practice*. Cambridge: Polity Press.

Bourdieu, P. (1999). The Contradictions of inheritance. In P. Bourdieu, A. Accardo, S. G. Balazs, F. B. Beaud, E. Bourdieu, P. Bourgois, S. Broccolichi, P. Champagne, J. R. Christin, P. Faguer, S. Garcia, R. Lenoir, F. Oeuvrard, M. Pialoux, L. Pinto, D. Podalydes, A. Sayad, C. S. Loic & J. D. Wacquant (Eds.), *Weight of the world: social suffering in contemporary society*. Cambridge: Polity Press.

Bourdieu, P., & Passeron, J.-C. (1977). *Reproduction in education, society and culture.* (R. Nice, Trans. Second ed.). London: SAGE.

Bourdieu, P., & Wacquant, L. (1992). *An invitation to refexive sociology*. Chicago: University of Chicago Press.

Breen, R., & Goldthorpe, J. H. (1997). Explaining Educational Differentials: Towards a Formal Rational Action Theory. *Rationality and Society, 9*(3), 275-305.

Bronfenbrenner, U. (1979). *The Ecology of Human Development*. Cambridge: Harvard University Press.

Browne, W. J. (2009). MCMC estimation in MLWiN. Version 2.13. Bristol: Centre for Multilevel Modelling. University of Bristol.

Bryk, A., & Raudensbush, S. (1992). *Hierarchical linear models for social and behavioral research: applications and data analysis methods*. Newbury Park: CA: SAGE.

Bryk, A. S., Holland, P. B., & Lee, V. E. (1993). *Catholic Schools and the Common Good*. Cambridge: Harvard University Press.

Byrne, D. (1998). *Complexity theory and the social science. An introduction*. London: Routedge.

Cano, F. (1997). *Factores asociados al logro cognitivo de los estudiantes. Grados 3º, 5º (1993-1994)*. Bogotá: MEN.

Cervini, R. (2001). Efecto de la Oportunidad de Aprender sobre el logro en Matematicas en la educacion basica argentina. *Revista Electrónica de Investigación Educativa, 3*(2).

Cervini, R. (2002). Desigualdades en el logro académico y reproducción cultural en Argentina. Un modelo de tres niveles. *Revista Mexicana de Investigación Educativa, 7*(16), 445-500.

Cervini, R. (2003). Diferencias de resultados cognitivos y no-cognitivos entre estudiantes de escuelas públicas y privadas en la educación secundaria de Argentina: Un análisis multinivel. *Education Policy Analysis Archives, 11*(6).

Cervini, R. (2006). Progreso de Aprendizaje en la Educación Secundaria Básica de Argentina: Un Análisis Multinivel de Valor Agregado. *Revista Electrónica Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 4*(3), 54-83.

Cervini, R. (2009). Comparando la inequidad en los logros escolares de la educacion primaria y secundaria en Argentina. Un estudio multinivel. *Revista Iberoamericana sobre Calidad, Eficacia y Cambio en Educacion, 7*(1), 6-21.

Coe, R., & Fitz-Gibbon, C. T. (1998). School Effectiveness Research: Criticisms and Recommendations. *Oxford Review of Education, 24*(4), 421-438.

Cohen, J. (2006). Social, emotional, ethical and academic education: Creating a climate for learning, participation in democracy and well-being. *Harvard Educational Review, 76*(2), 201-237.

Coleman, J. (1986). *High School and Beyond*. Berkeley: Perseus Book Group.

Coleman, J. S. (1966). *Equality of educational opportunity*. Washington, D.C.: U. S. Department on H. E. W., Office of Education.

Coleman, J. S. (1988). Social capital in the creation of human capital. *The American Journal of Sociology, 94*(Suplement), S95-S120.

CONALITEG. (2007). Historia de la CONALITEG 1959-2007. Retrieved 30 June 2009, 2009, from http://www.conaliteg.gob.mx/

CONAPO. (2001). Indices de marginacion 2000. Retrieved 11 October 2009, from Consejo Nacional de Poblacion: http://www.conapo.gob.mx/publicaciones/indices/pdfs/000.pdf

CONAPO. (2006). Indices de marginacion 2005. Retrieved 11 October 2009, from Consejo Nacional de Poblacion: http://www.conapo.gob.mx/publicaciones/indice2005.htm

Concha, C. (1996). *Escuelas efectivas en Chile: estudio de 32 escuelas exitosas en logros académicos y de alta vulnerabilidad.* Unpublished doctorate thesis, Pontificia Universidad Católica de Chile, Santiago de Chile.

Creemers, B. (1994). *The effective classroom*. London: Cassell.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of test. *Psychometrika*(16), 297-334.

CSEE. (2008). School Climate Research Summary. Retrieved 25/08/09, from http://nscc.csee.net/effective/school_climate_research_summary.pdf

Cueto, S., Ramirez, C., Leon, J., & Pantin, O. (2003). *Oportunidades de aprendizaje y rendimiento en una muestra de estudiantes de sexto grade de primaria en Lima*. Lima: GRADE.

Cuttance, P. F. (1985). Methodological Issues in the Statistical Analysis of Data on the Effectiveness of Schooling. *British Educational Research Journal, 11*(2), 163-179.

Chalmers, A. (1994). *What is this thing called science? An assessment of the nature and status of science and its methods* (Second ed.). Buckingham: Open University Press.

Chatfield, C. (1995). *Problem Solving: A Statistician's Guide* (325 ed.). London: CRC Press

Child, D. (2006). *The essentials of factor analysis* (Third ed.). London: Continuum.

Davies, L. (1997). The rise of the school effectiveness movement. In J. White & M. Barber (Eds.), *Perspectives on School Effectiveness and School Improvement*. London: Institute of Education.

De la Graza, E. (2004). La evaluación educativa. *Revista mexicana de investigación educativa, 9*(23), 807-816.

Deleuze, G., & Guattari, F. (1972). *Anti-Oedipus: Capitalism and schizophrenia* (R. Huxley, M. Seem & H. Lane, Trans.). New York: Viking Press.

Dohn, N. B. (2007). Knowledge and Skills for PISAAssessing the Assessment. *Journal of Philosophy of Education, 41*, 1-16.

Edmonds, R. (1979). Effective Schools for the Urban Poor. *Educational Leardeship*(37), 15-24.

Elmore, R. F. (1978). Organizational models of social program implementation. *Public Policy, 26*, 185-228.

Everitt, B. (2001). *Statistics for psychologists an intermediate course*. Mahwah, N.J.: L. Erlbaum.

Fairclough, N., Jessop, R., & Sayer, A. (2004). *Critical realism and semiosis*. London: Routledge.

Farrington, D. P. (1993). Understanding and Preventing Bullying. *Crime and Justice, 17*, 381-458.

Fernández, T. (2003a). *Tres estudios sobre determinantes sociales del rendimiento escolar*. México: Instituto Nacional para la evaluación de la Educación.

Fernández, T. (2003b). *Contextualización sociocultural de las escuelas de la muestra de Estándares Nacionales (1998-2002)*. México: Instituto Nacional para la Evaluación de la Educación.

Fernández, T. (2004). *Distribución del conocimiento escolar: clases sociales, escuelas y sistema educativo en Latinoamérica.* Unpublished doctorate thesis, El Colegio de Mexico, Mexico.

Fernández, T. (2007). *Distribución del conocimiento escolar : clases sociales, escuelas y sistema educativo en América Latina*. Mexico: El Colegio de México, Centro de Estudios Sociológicos.

Fernández, T., Banegas, I., Blanco, E., & Méndez, G. (2004). *Fundamentos teóricos de los conceptos propuestos a ser observados en los módulos permanentes del Sistema de Cuestionarios de Contexto para el ciclo de evaluaciones 2005-2008. documento preliminar para la discusión de la sesión del Consejo Técnico del INEE.* México, D.F.: Instituto Nacional para la Evaluación de la Educación.

Fernández, T., & Blanco, E. (2004). ¿Cuánto importa la escuela? El caso de México en el contexto de América Latina. *Revista Electrónica Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 2*(1).

Fischer, H. R. (2001). Abductive Reasoning as a Way of Worldmaking. *Foundations of Science, 6*, 361-383.

Flores-Crespo, P., & De la Torre, R. (2007). *Adopting the Human Development idea: Lessons drawn from some poverty reduction initiatives in Mexico*.

Paper presented at the International Conference of the Human Development and Capability Association 2007.

Fonagy, P., Twemlow, S. W., Vernberg, E., Sacco, F. C., & Little, T. D. (2005). Creating a peaceful school learning environment: the impact of an antibullying program on educational attainment in elementary schools *Med Sci Monit, 11*(7), 317-325.

Forster, M. R. (1998). Lakatos's Methodology of Scientific Research Programs. Retrieved 26th November 2007, from http://philosophy.wisc.edu/Forster/220/notes_3.html

García Castro, G., & Bartolucci, J. (2007). Aspiraciones educativas y logro academico: Un estudio de caso sobre caracteristicas y condiciones sociales de los estudiantes de la UNAM. *Revista Mexicana de Investigación Educativa, 12*(35), 1267-1288.

Gewirtz, S. (1998). Can All Schools Be Successful? An Exploration of the Determinants of School 'Success'. *Oxford Review of Education, 24*(4), 439-457.

Goldstein, H. (1987). *Multilevel models in educational and social research*. London: Griffin.

Gonzalez-Casanova, P. (2004). *Las nuevas ciencias y las humanidades. De la academia a la política*. Barcelona: Anthropos.

González, I. B., & Bosco, E. B. (2006). *Policies and systems for the assessment of education*. Mexico: Instituto Nacional para la Evaluacion de la Educacion.

Haig, B. D. (1991). Meta-analysis, methodology and research integration. *International Journal of Educational Research, 15*, 499 - 597.

Haig, B. D. (2005a). An Abductive Theory of Scientific Method. *Psychological Methods, 10*(4), 371-388.

Hair, J., Anderson, R., Tatham, R., & Black, W. (1999). *Análisis Multivariante*. Madrid: Prentice Hall.

Harre, R. (1976). The constructive role of models. In L. Collins (Ed.), *The use of models in the social sciences* (pp. 16 - 43). London: Tavistock.

Hedström, P., & Swedberg, R. (2008). Rational choice and sociology. In S. N. Durlauf & L. E. Blume (Eds.), *The New Palgrave Dictionary of Economics* (pp. 872-877). New York: Palgrave Macmillan,.

Herman, J., & Klein, D. (1997). *Assessing Opportunities to Learn: A California Example*. Los Angeles: National Center for Research on Evaluation, Standards, and Student Testing - University of California.

Herrera, M., & López, M. d. l. P. (1996). *La eficacia escolar*. Caracas: CICE/CINTERPLAN.

How, A. (2003). *Critical Theory*. London: Palgrave McMillan.

Husen, T. (1967). *International study of achievement in mathematics: A comparison of twelve countries*. Stockholm: International Association for the Evaluation of Educational Achievement (IEA).

INEE. (2006). Base de datos de los Exámenes de la Calidad y el Logro Educativos Tercer Grado de Secundaria 2005. Retrieved 8th June 2009, from Instituto Nacional para la Evaluacion de la Educacion: http://www.inee.edu.mx/index.php?option=com_content&view=category&layout=blog&id=423&Itemid=1284

Irigaray, L. (2002). *The way of love*. London: Continuum.

Jencks, C. S., Smith, M., Ackland, H., Bane, M. J., Cohen, D., & Ginter, H. (1972). *Inequality: A reassessment of the effect of the family and schooling in America*. New York: Basic Books.

Klitgaard, R. E., & Hall, G. R. (1975). Are There Unusually Effective Schools? *The Journal of Human Resources, 10*(1), 90-106.

Kohn, M. (1989). *Class and Conformity: A Study in Values*. Chicago: Chicago University Press.

Kristen, C., Römmer, A., Müller, W., & Kalter, F. (2005). *Longitudinal Studies for Education Reports: European and North American Examples* (Vol. 10). Berlin: German Federal Ministry of Education and Research (BMBF).

Kyriakides, L. (2005). Extending the Comprehensive Model of Educational Effectiveness by an Empirical Investigation. *School Effectiveness and School Improvement, 16*(2), pp. 103-152.

Lakatos, I. (1970). Falsification and the methodology of scientific research programmes. In I. Lakatos & A. Musgrave (Eds.), *Criticism and the Growth of Knowledge* (pp. 91-195). Cambridge: Cambridge University Press.

Lara, C. L. (2008). Addressing the Telesecundaria in Zacatecas, Mexico: Merits of the learning community. *The International Journal of Interdisciplinary Social Sciences, 3*(4).

Lauder, H. (2007). *The architecture of theories*.Unpublished manuscript, Bath.

Lauder, H., & Brown, C. (2007). *An appraisal competing research programmes on school effectivenes and school improvement*.Unpublished manuscript, Bath.

Lauder, H., Brown, P., Dillabough, J., & Halsey, A. H. (2006). Introduction: The Prospects for Education: Individualization, Globalization and Social Change. In H. Lauder, P. Brown, D. J. & A. H. Halsey (Eds.), *Education, Globalization and Social Change*. Oxford: Oxford University Press.

Lauder, H., Brown, P., & Halsey, A. H. (2004). Sociology and political arithmetic: some principles of a new policy science. *The British Journal of Sociology, 55*(1).

Lauder, H., Jamieson, I. M., & Wikeley, F. (1998). Models of Effective Schools: Limits and Capabilities. In R. Slee, G. Weiner & S. Tomlinson (Eds.), *School Effectiveness for Whom? Challenges to the School Effectiveness and School Improvement Movements*. London: Falmer Press.

Lauder, H., Kounali, D., Robinson, A., & Goldstein, H. (2008). *Social class, pupil progress and school performance: an analysis of English primary schools*.Unpublished manuscript, Bath.

Linacre, J. M. (2008a). *A user's guide to Winsteps. WINSTEPS Manual for Rasch Analysis*. Chicago: Winsteps.

Linacre, J. M. (2008b). Winsteps. Chicago.

Liu, S. (2006). *School Effectivenes Research in China.* Unpublished Doctoral, Louisiana State University, Louisiana.

Lupton, R. (2004). *Schools in disadvantaged areas: recognising context and raising quality*. London: London School of economics.

Lupton, R. (2005). Social justice and school improvement: improving the quality of schooling in the poorest neighbourhoods. *British Educational Research Journal, 31*(5), 589 - 604.

Luyten, H., Visscher, A., & Witziers, B. (2005). School Effectiveness Research: From a review of the criticism to recommendations for further development. *School Effectiveness and School Improvement, 16*(3), 249-279.

LLECE. (2001). *Primer estudio internacional comparativo sobre Lenguaje, Matemática y factores asociados, para alumnos del tercer y cuarto grado de la educación básica*. Santiago de Chile: UNESCO - Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación.

Ma, X., & Kishor, N. (1997). Assessing the Relationship between Attitude toward Mathematics and Achievement in Mathematics: A Meta-Analysis. *Journal for Research in Mathematics Education, 28*(1), 26-47.

Magriñá, A. (2003). *Evaluación Inicial de los Procesos de Calibración y Equiparación de las Pruebas del Proyecto de Estándares Nacionales* (Vol. 6). Mexico: INEE.

Mahon, M. (1992). *Faucalt's Nietzschean Genealogy*. Albany: State University of New York Press.

Martinez Rizo, F. (2003). *Pruebas y rendicion de cuentas*. Mexico: Instituto Nacional para la Evaluación de la Educación.

McDonnell, L. M. (1995). Opportunity to Learn as a Research Concept and a Policy Instrument. *Educational Evaluation and Policy Analysis, 17*(3), 305-322.

McDonough, P. (1996). *Choosing Colleges: How Social Class and Schools Structure Opportunity*. New York: State University of New York Press.

McLaughlin, M. W. (1998). Listening and learning from the field: Tales of policy implementation and situated practice. In A. Hargreaves, A. Liberman, M. Fullan & D. Hopkins (Eds.), *International handbook of educational change* (Vol. 5, pp. 70-84). Dordrescht / Boston / London: Kluwer Academic Publishers.

McNeill, P., & Townley, C. (1981). *Fundamentals of Sociology*. London: Hutchinson Educational.

Meichenbaum, D., Fabiano, G., & Fincham, F. (2002). Communication in relationships with adolescents: Implications for assessment and treatment. In T. Patterson (Ed.), *Comprenhensive Handbook for Psychotherapy* (Vol. 2, pp. 167-188). New York: John Wiley & Sons.

Mejia Botero, F. (2004). El Programa de Escuelas de Calidad en el Marco de la Politica de Desdcentralizacion Educativa en Mexico. *Revista Latinoamericana de Innovaciones Educativas, 34*(4), 165-192.

Miles, M. B. (1998). Finding keys to school change: a 40-year odyssey. In A. Hargreaves, A. Liberman, M. Fullan & D. Hopkins (Eds.), *International handbook of school change* (Vol. 5, pp. 37-39). Dordrescht / Boston / London: Kluwer Academic Publishers.

Miller, S., & Fredericks, J. (1990). The false ontology of school climate effects. *Educational Theory, 40*(3), pp. 333-342.

Mortimore, P., Sammons, P., Stoll, L., Lewis, D., & Ecoh, R. (1988). *School Matters: The Junior Years*. Wells: Open Books.

Muñoz-Izquierdo, C., Márquez, A., Sandoval-Hernández, A., & Sánchez, H. (2004). *Factores externos e internos a las escuelas que influyen en el logro académico de los estudiantes de nivel primaria en México, 1998-2002. Análisis comparativo entre entidades con diferente nivel de desarrollo.* México: Instituto Nacional para la Evaluación de la Educación.

Muñoz-Izquierdo, C., & Villarreal, G. (2005). *Un marco referencial para interpretar los efectos educativos de los programas compensatorios*. Paper presented at the Research Conferenece: Poverty and poverty reduction strategies: mexican and international experience. Retrieved from http://www.itesm.mx/egap/cp/pres/07pres.pdf

Murillo, F. J. (2003). Una panorámica de la investigación iberoamericana sobre eficacia escolar. *Revista Electrónica Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 1*(1).

Murillo, F. J. (2004). Un marco comprensivo de Mejora de la Eficacia Escolar. *Revista Mexicana de Investigación Educativa, 9*(21), 319-359.

Murillo, F. J. (2007). School Effectivenes Research in Latin America. In T. Townsend (Ed.), *International Handbook of School Effectiveness and Improvement* (Vol. 17, pp. 75-91). Dordrecht: Springer.

Murillo, F. J., Castañeda, E., Cueto, S., Donoso, J. M., E., F., Hernández, M. L., et al. (2007). *Investigación Iberoamericana sobre Eficacia Escolar*. Bogota: Convenio Andres Bello.

Murillo, F. J., & Román, M. (2009). Mejorar el desempeño de los estudiantes de America Latina. Algunas reflexiones a partir de los resultados del SERCE. *Revista Mexicana de Investigación Educativa, 14*(41), 451-484.

Nash, R. (1999b). What is Real and What is Realism in Sociology? *Journal for the Theory of Social Behaviour, 29*(4), 445-466.

Nash, R. (2002). Numbers and Narratives: further reflections in the sociology of education. *British Journal of Sociology of Education, 23*(3), 397 - 412.

Need, A., & de Jong, U. (2001). Educational differentials in the Netherlands: testing rational action theory. *Rationality and Society, 13*, 71-98.

OECD / UNESCO. (2003). *Literacy Skills for the World of Tomorrow - Further results from PISA 2000*. Paris: Organisation for Economic Co-operation and Development / United Nations Educational, Scientific and Cultural Organization.

Opdenakker, M., & Van Damme, J. (2001). Relationship between school composition and characteristics of school process and their effect on mathematics achievement. *British Educational Research Journal, 27*(4), 407 - 432.

Pardo, A., & Ruiz, M. (2002). *SPSS 11. Guía para el Análisis de Datos*. Madrid: McGraw-Hill Hispanoamericana.

Peirce, C. S., Houser, N., Kloesel, C. J. W., & Peirce Edition, P. (1992). *The essential Peirce : selected philosophical writings* (Vol. 1 and 2). Bloomington: Indiana University Press.

Peña-Suarez, E., Fernandez-Alonso, R., & Muñiz-Fernandez, J. (2009). Estimacion del valor Añadido de los centros escolares. *Aula Abierta, 37*(1), 3-18.

Perry, A. (1908). *The management of a city school*. New York: Macmillan.

Pickering, J. (2001). *Human Identity in the Age of Software Agents.* Paper presented at the Cognitive Technology: Instruments of Mind. 4th International Conference, Coventry, UK.

Piñeros, L. J., & Rodríguez Pinzón, A. (1998). *Los insumos escolares en la educación secundaria y su efecto sobre el rendimiento académico de los estudiantes. Un estudio en Colombia* (No. 36). Washington: World Bank.

Popham, J. (1990). *Modern Educational Measurement : A practitioner's perspective*. Englewood Cliffs, NJ: Prentice-Hall.

Popper, K. (1963). *Conjectures and refutations. The growth of scientific knowledge*. London: Routledge & Kegan Paul.

Putnam, R. (1995). Bowling alone: America's declining social capital. *Journal of Democracy, 6*(1), 65-78.

Rabe-Hesketh, S., Skrondal, A., & Zheng, X. (2006). Multilevel structural equation modeling. In S. Y. Lee (Ed.), *Handbook on Structural Equation Models*. Amsterdam: Elsevier.

Rasbash, J., Charlton, C., Browne, W. J., Healy, M., & Cameron, B. (2009). MLwiN Version 2.10. Bristol: Centre for Multilevel Modelling, University of Bristol.

Rasch, G. (1960). *Probabilistic Models for some Attainment and Intelligence Tests*. Copenhagen: Danmarks Pedagogiske Institut.

Reay, D. (2002). Shaun's story: troubling discourses of white working class masculinities. *Gender and Education, 14*, 221-234.

Reay, D. (2004). It's all becoming a habitus: beyond the habitual use of habitus in educational research. *British Journal of Sociology of Education, 25*(4), 431-444.

Reay, D., David, M., & Ball, S. (2001). Making a Difference?: Institutional Habituses and Higher Education Choice. *Sociological Research Online, 5*(4).

Rosenholtz, S. J. (1985). Effective Schools: Interpreting the Evidence. *American Journal of Education, 93*(3), 352-388.

Rowan, B. (1983). Research on School Effectiveness: a cautionary note. *Educational Researcher, 12*(4).

Rutter, M., Maughan, B., Mortimore, P., & Ouston, J. (1979). *Fifteen Thousand Hours: Secondary Schools and Their Effects on Children*. London: Open Books.

Sammons, P., Thomas, S., & Mortimore, P. (1997). *Forging link: Effective schools and effective departments*. London: Paul Chapman Publishing.

Sandoval-Hernandez, A. (2008). Forms of inference, *Adapted from Fischer, 2001*.

Sandoval-Hernández, A. (2005). *La equidad en la distribución de oportunidades de acceso a la educación media superior en México. Un estudio con base en los datos del examen EXANI -I.* Universidad Iberoamericana, México, D.F.

Sandoval-Hernández, A. (2007). La equidad en la distribución de oportunidades educativas en México. Un estudio con base en los datos del EXANI-I.

Revista Electrónica Iberoamericana sobre Calidad, Eficacia y Cambio en Educación, 5(1), 22-42.

Sandoval-Hernández, A. (2008). School effectiveness research: a review of criticisms and some proposals to address them. *Educate~*(Special Issue), 31 - 44.

Sandoval-Hernández, A., & Muñoz-Izquierdo, C. (2004). Equidad y eficacia en la distribución de oportunidades de acceder a la educación media. In F. Tirado (Ed.), *Evaluación de la Educación en México.* (pp. 193-247). México: CENEVAL.

Santibanez, L., Martinez, J. F., Datar, A., McEwan, P. J., Setodji, C. M., & Basurto-Davila, R. (2007). *Analysis of the Assessment System and Impact of Mexico's Teacher Incentive Program "Carrera Magisterial"*. Santa Monica: The RAND Corporation.

Santibañez, L., Vernez, G., & Razquin, P. (2005). *Education in Mexico. Challenges and Opportunities*. Washington: Rand Corporation.

Scott, W. R. (2003). *Organizations: Rational, Natural, and Open Systems* (5th ed.). New York: Prentice Hall.

Schagen, I., & Weston, P. (1998). Insights into School Effectiveness from Analysis of OFSTED's School Inspection Database. *Oxford Review of Education, 24*(3), 337-344.

Scheerens, J. (2000). *Improving School Effectiveness* (Vol. 68). Paris: UNESCO - IIEP.

Scheerens, J., & Bosker, R. (1997). *The Foundations of Educational Effectiveness*. Oxford: Pergamon.

Scherman, V. (2007). *The validity of value-added measures in Secondary Schools.* Unpublished Doctoral, University of Pretoria, Pretoria.

Schmidt, W., & McKnight, C. (1995). Surveying educational opportunity in mathematics and science: An international perspective. *Educational Evaluation and Policy Analysis, 17*(3), 337-353.

Secretaria de Desarrollo Social. (2009). Programa de Desarrollo Humano Oportunidades. Retrieved 25 April 2009, from http://www.oportunidades.gob.mx

Selznick, P. (1948). Foundations of the Theory of Organization. *American Sociological Review, 13*(2), 25-35.

SEP. (2001). *Cómo transformas las escuelas? Lecciones aprendidas desde la gestión escolar y la práctica pedagógica*. México, D.F.: Secretaría de Educación Pública - Dirección General de Evaluación.

SEP. (2004). *Informe de labores de la Secretaría de Educación Pública*. México: Secretaría de Educación Pública.

SEP. (2005). ¿Cuáles son las oportunidades que ofrece la educación secundaria? *Consulta Nacional Sobre la Reforma Integral de la Educación Secundaria* Retrieved March 27th 2006, 2006, from http://www.consultaries.sep.gob.mx/tripticos/oportunidades.pdf

Shepherd, J. (2008, Monday 7 January). 'Fairer' school league tables misleading study. *The Guardian*. Retrieved from http://www.guardian.co.uk/uk/2008/jan/07/schools.politics

Silas Casillas, J. C. (2008). Porque Miriam si va a la escuela? *Revista Mexicana de Investigación Educativa, 13*(39), 1255-1279.

Slee, R., Weiner, G., & Tomlinson, S. (1998). *School Effectiveness for whom?Challenges to the school effectiveness and school improvement movements.* London: Falmer Press.

Stables, A. (2003). School as Imagined Community in Discursive Space: A Perspective on the School Effectiveness Debate. *British Educational Research Journal, 29*(6), 895-902.

Steele, F. (2008). Introduction to Multilevel Modelling. MLwiN Practicals. In Centre for Multilevel Modelling (Ed.), *LEMMA Course*. Bristol: University of Bristol.

Stringer, E. T. (2007). *Action Research*. London: Sage.

Tatto, M. T. (1999). Education Reform and State Power in Mexico: The Paradoxes of Decentralization. *Comparative Education Review, 43*(3), 251-282.

Taylor, N., Muller, J., & Vinjevold, P. (2003). *Getting schools working: Research and systemic school reform in South Africa*. Cape Town: Pearson Education.

Teddlie, C., & Reynolds, D. (2000). *The International Handbook of School Effectiveness Research*. London and New York: Falmer Press.

Teddlie, C., & Reynolds, D. (2001). Countering the Critics: Responses to Recent Criticisms of School Effectiveness Research. *School Effectiveness and School Improvement, 12*(1), 41-82.

Teddlie, C., Reynolds, D., & Pol, S. (2000). Current Topics and Approaches in School Effectiveness Research: The Contemporary Field. In C. Teddlie & D. Reynolds (Eds.), *The International Handbook of School Effectiveness Research* (pp. 26-52). London: Falmer Press.

Teddlie, C., Reynolds, D., & Sammons, P. (2000). The Methodology and Scientific Properties of School Effectiveness Research. In C. Teddlie & D. Reynolds (Eds.), *The International Handbook of School Effectiveness Research* (pp. 55 - 133). London: Falmer Press.

Thagard, P. (1988). *Computacional philosophy of science*. Cambridge, MA: MIT Press.

Thagard, P. (1992). *Conceptual Revolutions*. Princeton, NJ: Princeton University Press.

Thagard, P. (1998). *Computacional philosophy of science*. Cambridge, MA: MIT Press.

Thrupp, M. (1998). Exploring the Politics of Blame: School Inspection and Its Contestation in New Zealand and England. *Comparative Education, 34*(2), 195-209.

Thrupp, M. (1999). *Schools Making a Difference: Let's Be Realistic! : School Mix, School Effectiveness, and the Social Limits of Reform*. London: Open University Press.

Thrupp, M. (2001a). Recent School Effectiveness Counter-critiques: problems and possibilities. *British Educational Research Journal, 27*(4), 443-457.

Thrupp, M. (2001b). Sociological and political concerns about school effectiveness research: Time for a new research agenda. *School Effectiveness and School Improvement, 12*, pp. 7-40.

Tirado Segura, F., (ed.). (2004). *Evaluación de la educación en México. Indicadores del EXANI-I*. Mexico: CENEVAL.

Torres Cervantes, C. R. (2009). *The effect of Oportunidades on the educational aspirations of indigenous girls in the Mexican municipality of Atlacomulco. An evaluation from the Rational Action Theory perspective.* Unpublished MRes thesis, University of Bath, Bath.

Treviño, E. (2006). Expectativas de los docentes en aulas con estudiantes indígenas en Bolivia, México y Peru *Revista Latinoamericana de Estudios Educativos 33*(2), 83 - 118.

Tristan Lopez, A., Flores-Cervantes, I., Diaz Gutierrez, M. A., Flores Vázquez, G., Solis Gonzalez, R., Canales Sanchez, D., et al. (2008). *Analisis Multinivel de la calidad educativa en Mexico ante los datos de PISA 2006*. Mexico: Instituto Nacional para la Evaluacion de la Educacion.

Tukey, J. W. (1977). *Exploratory data analysis*. Rading, MA: Addison Wesley.

Twisk, J. W. R. (2006). *Applied multilevel analysis: a practical guide*. Cambridge: Cambridge University Press.

Ullman, J. B. (2001). Structural Equation Modelling. In B. G. Tabachnick & L. S. Fidell (Eds.), *Using Multivariate Statistics* (pp. 653-771). Boston / London / Toronto / Tokio / Singapure: Allyn and Bacon.

UNESCO. (2006). *Teachers and educational quality: Monitoring global needs for 2015*. Montreal: UNESCO - Institute for Statistics.

Valdés, H., Treviño, E., Acevedo, C. G., Castro, M., Carrillo, S., Costilla, R., et al. (2008). *Los aprendizajes de los estudiantes de América Latina y el Caribe*. Santiago: Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación (LLECE)

Van Breda, A. D. (2001). Resilience Theory: A Literature Review Available from http://www.vanbreda.org/adrian/resilience.htm

Wang, M. C., Haertel, G. D., & Walberg, H. J. (1993). Toward a Knowledge Base for School Learning. *Review of Educational Research, 63*(3), 249-294.

Weick, K. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly, 21*(1), 1-19.

Whitehead, J., & McNiff, J. (2006). *Action Research Living Theory*. London: Sage.

Willmott, R. (1999b). Structure, Agency and School Effectiveness: researching a 'failing' school *Educational Studies, 25*(1), 5 - 18.

Willmott, R. (2003). New Labour, school effectiveness and ideological commitment. In J. Cruickshank (Ed.), *Critical Realism: The Difference it Makes* (pp. 128-148). London and New York: Routledge.

Winfield, L., & Woodard, M. (1994). Assessment, Equity, and Diversity in Reforming American's Schools. *Educational Policy, 8*(1), 3-27.

Wright, B. D., & Linacre, J. M. (1994). Reasonable mean-square fit values. *Rasch Measurement Transactions, 8*(3), 370.

Wrigley, T. (2004). 'School effectiveness': the problem of reductionism. *British Educational Research Journal, 30*(2), 227 - 244.

Zorrilla, M., & Romo, J. M. (2004). La educación secundaria en Aguascalientes 1999 al 2002. Un análisis de factores asociados a los resultados escolares en español y matemáticas en EXANI-I. In F. Tirado (Ed.), *Evaluación de la educación en México, Indicadores EXANI I*. Mexico: Centro Nacional de Evaluación para la Educación Superior (CENEVAL).

ANNEX A. INEE's model of educational achievement

The construction of instruments to collect information about the context and thus the selection of the variables used in the explicative models developed by the INEE is based in the following conceptual model of educational achievement.

This model is oriented to explain the *learning opportunities* as the main basis of the student educational achievement. It also considers the distinction of different levels, i.e. system, school, classroom and student; as well as the distinction among background or input (what the student is expected to learn), processes (teaching organization) and results (what the students actually learn). At the same time it intends to distinguish between the formal or intended curriculum (at the system level), the implemented curriculum (at the classroom level) and the achieved curriculum (at the student level).

The next diagram illustrates the aggregation levels and the variables that have an influence in educational achievement. In the diagram, the latent variables (not directly observable) are shown in ovals; the observable variables are in solid rectangles and the variables combining these two kinds of indicators are in dashed rectangles.

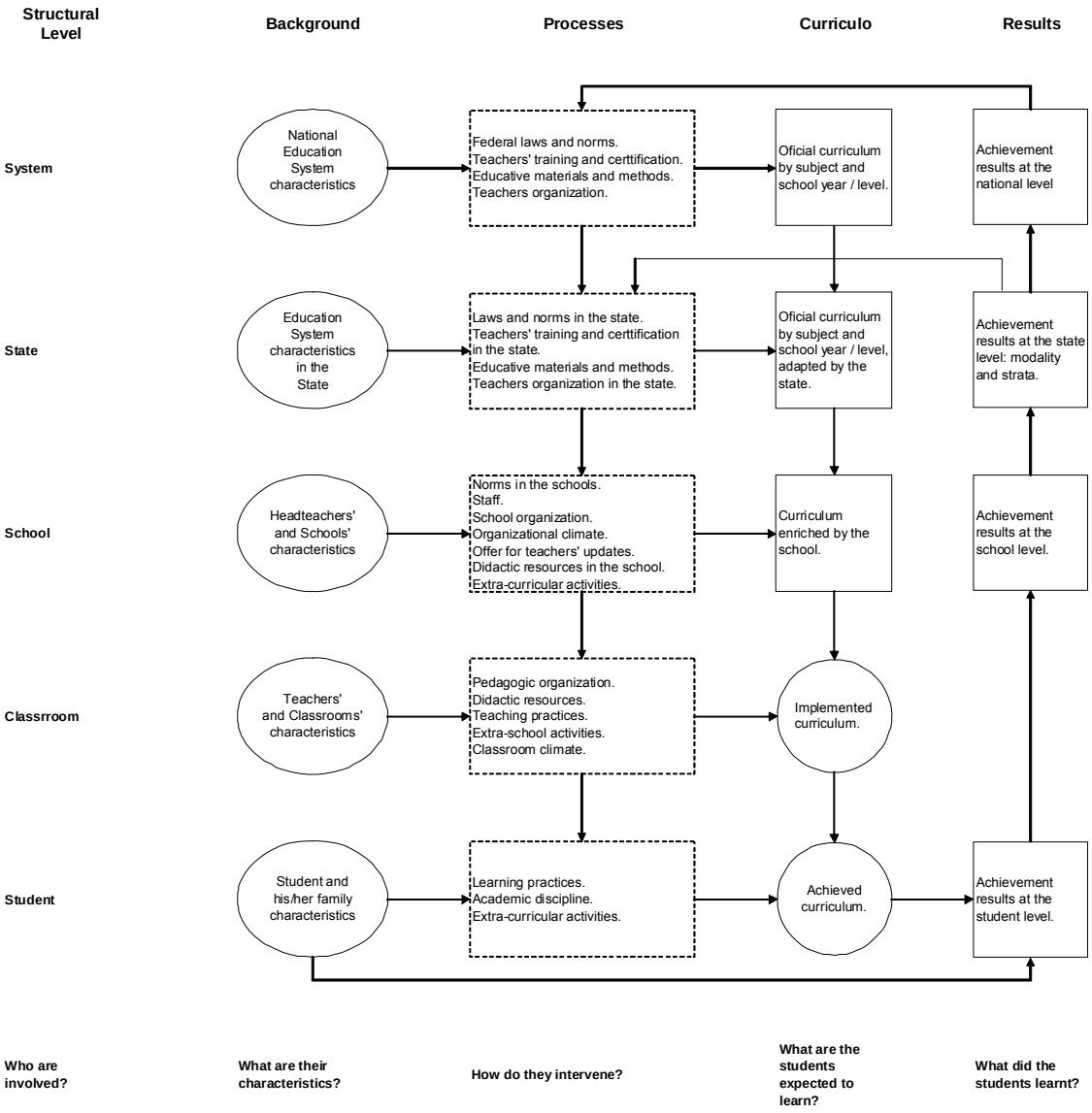


Figure 9. INEE´s model of educational achievement

Source: (Backhoff, Andrade, et al., 2006, my own translation)

Annex B. Dimensions and variables considered in the context questionnaires

Consistent with this model a system of context questionnaires for students, teachers and head-teachers was designed in order to achieve the next objectives:

1. To determine the personal and socio-cultural characteristics of the main actors involved in education: students (and their families), teachers and head-teachers.

2. To determine the physic infrastructure, pedagogic resources and basic services these actors have available: in the student household, in the teacher classroom and in the head-teacher school.

3. To determine the activities directly and indirectly related with the teaching-learning process: the school and outside school activities carried out by the student, the didactic and pedagogic activities carried out by the teacher and the academic support and administrative activities carried out by the head-teacher.

4. To determine the social climate involving the students: the intra-family relationships, the social climate in the classroom, the school climate and the insecurity climate in the school and its surroundings.

5. To determine to what extent the proposed or intended curriculum is actually covered.

Student context questionnaires

The student context questionnaires were designed with the idea of exploring three main areas, which are related with personal, family and school characteristics.

Each of these areas is divided in dimensions or variables, which are formed by specific contents. In the next table, the structure of the student context questionnaires is presented. As it can be seen, it consists in 3 areas, 17 dimensions and 48 specific contents. In total, this questionnaire has 108 items.

Table 38. Structure of the student context questionnaires

Area	Dimensions	Contents
Personal	Socio-demographic	Age
		Gender
		Ethnicity
		Disability
		Employment
	Cognitive resources	Foreign language
		Academic performance
	Academic commitment	Attendance
		Punctuality
		Homework
		Time spent studying
		Expectations
	Study practices	Language
		Mathematics
	Academic background	Pre-school
		Age of insertion
		How far the school is
		Course repetition
		Mobility / Turbulence
	Risky behaviour	Anti-social behaviour
		Consumption of addictive substances
		Conduct evaluation
	Cultural capital	Spare time activities
		Reading likeness

Family	Family composition	Who the student lives with
		How many people live with the student
	Cultural Capital	Expectations
		Parent's level of education
		How many books are in the house
	Economic Capital	How much money the student receives
		Scholarships
		Characteristics of the household
		Services in the household
		Ownership of real estate
	Family education	Supervision
	Family climate	Family conflicts
School	Learning opportunities	Teachers' attendance
		Teachers' punctuality
	Teaching practices	Language
		Mathematics
	School climate	Perception of demand from teacher / school
		Satisfaction with the teacher
		Violence

Teacher context questionnaires

The teacher context questionnaires were designed to explore three areas or main aspects: personal characteristics, pedagogical practices and school characteristics.

The next table shows the structure of this questionnaire, which consists of 3 axes, 10 dimensions and 38 different contents. In total, this instrument is formed by 142 items.

Table 39. Structure of the teacher context questionnaires

Area	Dimensions	Variables
Personal	Socio-demographic	Age
		Gender
		Ethnicity
	Economic capital	How many people live in the house
		How many bedrooms
		What the floor of the house is made of
		Goods in the household
		Services in the household
	Professional profile	Level of studies
		Certification of pedagogic studies
		Type of position
		Experience as a teacher
		Field of knowledge
		Actualization
	Incentives	Enrolment in incentives programme
	Additional job	Additional job
Pedagogical Practices	Planning	Time of preparation
		Support materials for preparing lessons
	Learning opportunities	Effective time
		Homework
		Evaluation
		Learning activities
		Curriculum coverage Language
		Curriculum coverage Mathematics
School	Group characteristics	Size
		Regular attendance
		Special educative needs
	School quality	School climate
		Transgressions
		Satisfaction
	Infrastructure, equipment and materials	General conditions
		Infrastructure
		Didactic materials
		Equipment
		Curricular materials

Head-teacher context questionnaire

The head-teacher context questionnaire is designed to explore two main areas or main aspects: personal and school characteristics.

The next table shows these two axes with their 11 dimensions and 30 specific contents. The total number of items is 72.

Table 40. Structure of the head-teacher context questionnaires

Areas	Dimensions	Variables
Personal	Socio-demographic	Gender Age Ethnicity Economic situation
	Professional profile	Level of studies Education system Type of position Trainning PRONAP trainning Other workshops
	Incentives	Enrolment in Carrera Magisterial programme
	Additional job	Additional job
School	Facilities	Facilities Problems with facilities Age of the building classrooms
	Equipment and furniture	Equipment Furniture
	Didactic and support materials	Didactic materials Support materials
	School groups	School groups Students
	School project and supervision	School project Work with teachers Academic monitoring
	School climate	School climate in general Students school climate Teachers school climate
	School links	Links between families and school

ANNEX C. Indices constructed for the students', teachers' and head-teachers' context questionnaires.

Table 41. Indices constructed for the students' context questionnaire

Specific content	Variable	Measurement	Internal adjustment	Internal consistency
Conflicts at home	Frequency of conflicts with parents	-0.27	0.94	0.76
	How conflictive is the household's climate	-1.16	0.91	
	How much conflicts last	1.44	1.13	
Family's cultural capital	Attendance to cinemas	0.42	0.93	0.84
	Attendance to museums	2.15	1.18	
	Attendance to theatres	2.53	1.12	
	Educational self expectation	-0.62	1.09	
	Parents' educational expectations	-0.94	0.96	
	Mother's literacy	-2.66	0.90	
	Father's literacy	-2.90	0.92	
	Mother's level of education	0.47	0.86	
	Father's level of education	0.28	0.82	
	Number of books in the household	1.27	1.18	
Family's economic capital	Type of floor in the household	-2.74	1.16	0.87
	Availability of electricity…	-6.33	0.99	
	Availability of sewerage…	-2.07	1.11	
	Availability of gas…	-3.50	0.86	
	Availability of telephone…	-0.82	0.94	
	Availability of internet…	1.96	0.79	
	Number of cars…	1.37	1.09	
	Number of fridges…	1.52	1.12	
	Number of microwaves…	3.46	0.87	
	Number of washing machines…	2.09	1.08	
	Number of TVs…	-1.63	0.93	
	Number of VHS players…	1.88	1.11	
	Number of DVD players…	2.08	0.97	
	Number of PCs…	2.72	0.81	
School homework	Number of homework in the last two months	-0.93	1.11	0.67
	Number of days a week with homework	-0.61	0.89	
	Number of hours a day spent in homework	1.54	0.96	

Use of an indigenous language	Mother tongue	-0.92	0.88	0.73
	Language spoken at home	-1.29	0.87	
	Language spoken at school	2.21	1.21	
Risky behaviour	Alcohol consumption	0.80	0.71	0.65
	Tobacco consumption	1.11	1.17	
Work out of home	Family business Volunteering Agricultural work Sales work Producing work (food, handcrafts) Housework at someone else's Services (shoes cleaning, car washing) Job hunting			0.60

Table 42. Indices constructed for the teachers' context questionnaire

Specific content	Variable	Measurement	Internal adjustment	Internal consistency
Classroom conditions	Adequacy of... natural illumination	-0.86	0.96	0.86
	Artificial illumination	0.27	0.91	
	Ventilation	0.32	1.00	
	Acoustic conditions	0.57	1.09	
	Classroom cleanness	0.20	0.85	
	Size of classroom	0.01	1.05	
	Condition of the… Blackboard	-1.03	1.03	
	Teacher's desk	0.71	1.17	
	Students' desks	-0.18	0.92	
Economic capital	Number of… Cars	1.93	1.06	0.82
	Fridges	2.44	1.02	
	Microwaves	4.60	0.92	
	Washing machines	3.12	1.01	
	PCs	2.84	0.90	
	TVs	-0.70	0.89	
	VCR players	2.54	1.00	
	DVD players	2.89	0.98	
	Type of floor in the household	-4.00	1.01	
	Availability of… Electricity	-8.14	1.00	
	Sewerage	-3.01	1.15	
	Gas	-4.46	1.07	
	Telephone	-1.78	0.96	
	Cable TV	0.18	1.08	
	Internet	1.56	0.94	

Laboural satisfaction	Would like to work in a different school	-0.58	1.19	0.84
	Level of satisfaction about… Rules and discipline in school	0.66	0.89	
	School's pedagogic approach	-0.11	0.78	
	Students' level of attainment	1.33	1.00	
	Relationship with students	-1.52	1.12	
	Relationship with other teachers	-0.63	0.93	
	Relationship with parents	-0.52	1.18	
	Relationship with the head teacher	-0.48	0.95	
	School infrastructure	0.83	1.02	
	Educative materials	1.02	0.93	
Risky climate in the neighbourhood	Alcohol consumption in the neighbourhood	-0.56	0.80	0.77
	Other drugs consumption in the neighbourhood	0.56	1.08	
Communication and Trust	Communication among school members	-0.26	0.97	0.94
	Trust among school members	0.26	0.97	
Academic situation and support	School is academically demanding	-0.16	0.97	0.85
	Students cope with the academic demands	0.52	1.21	
	There support among colleagues	-0.03	0.87	
	There are agreements for the academic work	-0.32	0.86	
School equipment	Availability of… Chalks	-0.46	1.03	0.87
	Blackboard eraser	-0.31	1.05	
	Didactic games	1.15	1.11	
	Stationary	0.24	0.86	
	Maps	0.62	0.98	
	Dictionaries and consult books	-0.56	0.97	
	Audiovisual materials	0.04	0.92	
	Materials for experiments in laboratories	0.68	0.98	
	Materials for Maths classes	0.29	0.98	
	Software	0.31	0.99	
	Sound recorder	0.13	0.94	
	TV	-0.93	0.89	
	DVD player	-0.26	0.96	
	PCs	-0.71	0.85	
	Internet	0.54	1.15	
	Sound system	-0.46	0.94	
	Audiovisual equipment	0.40	0.96	
	Photocopies machine	0.17	0.99	
	Materials for organising the curriculum (SEP)	-1.01	1.10	
	Teacher's books	-0.81	1.16	
	Materials for organising the curriculum (Private)	0.56	1.21	
	Books in the school library	0.42	1.15	

Use of educational resources	Opportunity in the availability of… Materials for organising the curriculum (SEP)	-0.63	0.84	0.69
	Teacher's books	-0.43	0.85	
	Materials for organising the curriculum (PRIVATE)	0.98	0.95	
	Books in the school library	0.51	1.15	
	Frequency of use…Materials for organising the curriculum (SEP)	-0.23	0.84	
	Teacher's books	0.09	0.94	
	Students' books	-0.91	1.17	
	Other materials	-0.77	1.02	
	Internet	1.39	1.13	
Violence in school and neighbourhood	Damage to school premises	-1.69	1.19	0.86
	Robbery in school	-1.14	1.11	
	Robbery with violence in school	1.09	1.10	
	Threatening among students	-0.23	1.03	
	Fights	-0.17	0.84	
	Students carrying knifes	0.61	0.99	
	Threatening to teachers	1.15	1.14	
	Robbery in the neighbourhood	-0.13	1.05	
	Robbery with violence in the neighbourhood	0.54	0.97	
	Physical or verbal aggressions to school members	-0.11	0.94	
	Fights in the neighbourhood	-0.46	0.76	
	People carrying weapons in the neighbourhood	0.54	1.08	

Table 43. Indices constructed for the head teachers' context questionnaire

Specific content	Variable	Measurement	Internal adjustment	Internal consistency
Administrative controls	Head teacher tracks... Each group's progress in the curriculum	1.55	1.05	0.97
	Each group's academic outcomes	-0.97	0.99	
	Work done by each commission	1.50	1.02	
	School calendar and timetables	-1.00	0.95	
	Progress in the school project	1.44	0.95	
	Attendance and punctuality of teachers	-1.92	1.00	
	Scholar controls for students	-0.61	1.02	
Consultancy given by head teacher	Consultancy to teachers about… Teaching approaches	0.24	0.99	0.79
	Group management and discipline	-0.63	0.93	
	Techniques and strategies for evaluation	-0.42	0.85	
	Administrative issues	0.81	1.19	

Curricular materials	Existence of… TV programs	-0.19	1.17	1.00
	Learning guides	-1.41	0.96	
	Basic Concepts documents	-1.58	1.00	
	Didactic guide	0.06	0.90	
	Curriculum	0.92	0.91	
	Study/Curriculum programmes	1.14	0.90	
	Condition of… Learning guides	-0.03	1.17	
	Didactic guide	0.92	0.95	
	Curriculum	1.19	0.84	
	Study/Curriculum programmes	1.23	0.83	
	Frequency of use of… TV programs	-0.16	1.20	
	Learning guides	-1.12	0.99	
	Basic Concepts documents	-1.76	0.99	
	Didactic guide	0.09	1.02	
	Curriculum	0.39	0.97	
	Study/Curriculum programmes	0.31	0.96	
Didactic planning	There are a school regulations	-1.58	1.14	0.91
	There is a school technical council	-1.37	1.04	
	School Project addresses the main issues of the school	-2.44	0.93	
	School Project has coherent objectives	-2.36	0.94	
	Teachers are invoved in the School Project	-0.39	0.96	
	School Project was initiated in a timely maner	0.74	1.02	
	School Project has been followed up	1.48	0.90	
	Good progress is shown in the School Project	0.89	0.93	
	Frequency of the Technical Council meetings	5.02	1.00	
Economic capital	Number of… Cars	0.86	1.02	0.82
	Fridges	1.6	0.95	
	Microwaves	3.58	0.86	
	Washing machines	2.73	1.01	
	PCs	2.06	0.9	
	VCR players	2.2	1.02	
	DVD players	2.77	1.02	
	Availability of… Sewerage	-3.32	1.09	
	Gas	-4.65	1.1	
	Telephone	-2.85	0.94	
	Cable TV	-0.91	1.12	
	Internet	0.63	0.85	
	Type of floor in the household	-4.7	0.97	
Infrastructure	Condition of classrooms	0.00	1.00	1.00
	Condition of library	0.00	1.00	
	Condition of PC rooms	0.00	1.00	
	Condition of sports fields	0.00	1.00	
	Condition of administrative offices	0.00	1.00	
	Condition of medical centre	0.00	1.00	

	Condition of toilettes	0.00	1.00	
	Condition of snacks-shop	0.00	1.00	
	Condition of green areas	0.00	1.00	
	Condition of furniture in classrooms	0.00	1.00	
	Condition of furniture in library	0.00	1.00	
	Condition of furniture in PC rooms	0.00	1.00	
	Condition of furniture in administrative offices	0.00	1.00	
	Condition of furniture in medical centre	0.00	1.00	
	Condition of furniture in toilettes	0.00	1.00	
	Condition of furniture in snacks-shop	0.00	1.00	
	Condition of PCs	0.00	1.00	
	Condition of enciclomedia	0.00	1.00	
	Condition of audiovisual equipment	0.00	1.00	
	Condition of first aids kit	0.00	1.00	
	Condition of sound equipment	0.00	1.00	
	Condition of sports equipment	0.00	1.00	
	Condition of blackboards	0.00	1.00	
	Condition of maps	0.00	1.00	
	Condition of posters	0.00	1.00	
	Condition of models for biology	0.00	1.00	
	Condition of complementary text-books	0.00	1.00	
	Condition of teachers journals or magazines	0.00	1.00	
	Condition of audio-visual materials	0.00	1.00	
	Condition of software	0.00	1.00	
	School general conditions	0.00	1.00	
	Frequency of floods in the school	0.00	1.00	
	Frequency of electrical failures	0.00	1.00	
	Existence of classrooms	-5.56	0.89	
	Existence library	0.36	0.95	
	Existence PC room	0.25	0.79	
	Existence sports fields	-0.52	0.97	
	Existence of administrative offices	-1.03	0.84	
	Existence medical services	3.18	0.89	
	Existence toilettes	-3.32	0.89	
	Existence of snacks shop	0.82	0.95	
	Existence green areas	-0.47	1.18	
	Existence of furniture in the classrooms	-5.38	0.89	
	Existence furniture in the library	0.45	0.92	
	Existence furniture in the PC room	0.17	0.80	
	Existence furniture in the administrative offices	-1.07	0.79	

	Existence furniture in the medical centre	3.11	0.88	
	Existence furniture in toilettes	-2.59	0.95	
	Existence furniture in the snack-shop	0.96	0.93	
	Existence PCs	-1.52	1.02	
	Existence audio-visual equipment	0.95	0.99	
	Existence of first aids kit	0.52	0.90	
	Existence sound equipment	-0.99	0.92	
	Existence sports equipment	0.21	0.91	
	Existence blackboards	-5.81	0.98	
	Existence maps	-0.18	0.95	
	Existence posters	0.28	1.01	
	Existence complementary text-books	-0.87	1.16	
	Existence audio-visual materials	-0.10	0.89	
	Existence of software	0.44	1.05	
	Sufficiency classrooms	0.70	1.18	
	Sufficiency library	1.49	1.07	
	Sufficiency PC rooms	1.96	0.96	
	Sufficiency sports fields	2.57	1.06	
	Sufficiency administrative offices	0.63	1.04	
	Sufficiency medical services	3.06	0.88	
	Sufficiency toilettes	0.97	1.18	
	Sufficiency snack-shop	0.00	1.00	
	Sufficiency green areas	0.00	1.00	
	Sufficiency furniture in classrooms	0.00	1.00	
	Sufficiency furniture in library	0.00	1.00	
	Sufficiency furniture in PC room	0.00	1.00	
	Sufficiency furniture in administrative offices	0.00	1.00	
	Sufficiency furniture in medical centre	0.00	1.00	
	Sufficiency furniture in toilettes	0.00	1.00	
	Sufficiency furniture in the snacks-shop	0.00	1.00	
	Sufficiency PCs	0.00	1.00	
	Sufficiency enciclomedia	0.00	1.00	
	Sufficiency audio-visual equipment	0.00	1.00	
	Sufficiency first aid kit	0.00	1.00	
	Sufficiency sound equipment	0.00	1.00	
	Sufficiency sports equipment	0.00	1.00	
	Sufficiency blackboards	0.00	1.00	
	Sufficiency maps	0.00	1.00	
	Sufficiency posters	0.00	1.00	
	Sufficiency models for biology	0.00	1.00	
	Sufficiency complementary text-books	0.00	1.00	
	Sufficiency teachers journals or magazines	0.00	1.00	

	Sufficiency audio-visual materials	0.00	1.00	
	Sufficiency software	0.00	1.00	
	Existence of text-books	0.00	1.00	
	Existence of ficheros	0.00	1.00	
	Existence of documents to register programmatic progress	0.00	1.00	
	Existence of curriculum	0.00	1.00	
	Building adequate for educational purposes	0.00	1.00	
	Availability of running water	0.00	1.00	
	Availability of electricity	0.00	1.00	
	Availability of sewerage	0.00	1.00	
	Availability of telephone	0.00	1.00	
	Availability of internet	0.00	1.00	
Infrastructure (telesec.)	Existence of… Parabolic antenna	-2.14	1.06	0.94
	Signal decoder	-1.92	1.04	
	Wiring	-1.79	1.14	
	TVs	-4.05	1.05	
	Sufficiency of… Parabolic antenna	-0.21	0.78	
	Signal decoder	-0.38	0.79	
	Wiring	1.17	0.92	
	TVs	1.11	1.00	
	VCR players	2.79	1.16	
	Condition of… Parabolic antenna	0.99	0.92	
	Signal decoder	0.2	0.92	
	Wiring	1.97	0.95	
	TVs	1.21	1.08	
	VCR players	1.05	1.14	
Laboral satisfaction	Level of satisfaction about… Discipline	-0.42	0.91	0.83
	Pedagogic approach	-0.45	0.83	
	Students' level of attainment	1.16	0.99	
	Relationship with students	-1.63	0.97	
	Relationship with teachers	-1.29	0.96	
	Relationship with parents	-0.79	1.09	
	School infrastructure	1.72	1.14	
	Educative materials	1.69	1.04	
Parents level of involvement	Parents level of participation in… Parents Association	0.34	1.06	0.68
	School ceremonies	0.00	0.99	
	School meetings	-0.28	0.90	
	Individual meetings with the head teacher	-0.07	1.05	

School climate	Level of agreement to… School is academically demanding	-0.54	1.17	0.92
	Students know what is expected from them	-0.06	1.32	
	Students are motivated	0.85	1.14	
	Teachers are team-players	0.3	0.82	
	There are support from colleagues	-0.68	0.77	
	Head teacher has friends at school	-0.07	1.13	
	Teachers collaborate to each other	-0.5	0.74	
	Teachers help students even out of school time	1.49	1.09	
	School investigates when a student has lots of absences	-1.12	1.04	
	There are not many conflicts among staff	0.13	1.15	
	Problems are solved in an adequate way	-1.22	0.9	
	There is good communication among the school community	-0.74	0.74	
	Teachers' work is well recognised	0.18	1.16	
	All teachers use the same pedagogic and didactic approaches	1.09	1.01	
	There is an agreement among teachers regarding school objectives	-0.1	0.8	
	Teachers have a plan to help students with the worst attainment	1.01	0.95	
Training	The head teacher has participated in training related to … Pedagogy	-1.59	1.03	0.76
	Administration	0.34	1.01	
	Supervision	1.59	0.98	
	School management	-0.64	1.02	
	Evaluation	-0.36	0.89	
	Human relationships	0.02	0.96	
	Communication with parents	0.64	1.14	

ANNEX D. Main characteristics of the Mexico's education system

The structure

According to the Article 10 of the General Law of Education, Mexico's Education System is formed by: students and teachers; educational authorities; plans, curricula, methods and educational materials; state schools and their decentralized organisms; private schools with authorization or recognition of official validity of studies; and the Higher Education Institutions, to whom the Law gives autonomy..

Up to now, the whole educational system enrols 33.7 million students, which is 63.41% of the population aged between 3 and 25.

The education system in Mexico has five main levels (the first three form basic education): preschool; primary education; lower secondary education; upper secondary education; and higher education.

For the first three levels, parents may choose the school for their children.
Article 3 of the Mexican Constitution states that basic education is compulsory for all the population and must be free, non-religious and provided by the Government.

Although the Government is only has to provide the basic education, it is also involved at the other levels and provide different options of upper secondary and higher education.

Preschool

Preschool provides early education for children between 3 and 5 years old, and currently enrols about 4.6 millions students, which is about 73.87% of the population in age to attend this educational level.

Recently, the Government introduced a new law that makes preschool part of compulsory education, in order to improve the coverage rates at this level.

Primary education

Primary education includes 6 grades to children between 6 and 12 years old, and currently it enrols14.8 million students, 92.45% of the population in this age group.

Primary education is offered in three different modalities: the general modality, which represents about 93.37% of the primary education, the community and the indigenous modalities, which together represents 6.63% of the primary education. The two last modalities are mostly offered in multi-grade schools, where a single teacher is in charge of delivering, at the same time, several grades. According to Santibañez et al. (2005), in the primary educational level one of each four schools are multi-grade.

Lower secondary education

Lower secondary education includes 3 grades for children between 13 and 15 years old and enrols 6.2 million students (SEP, 2005), which represents the 89.51% of the population in this status of age.

Lower secondary is also offered in four different main modalities: the general modality (50.33%), the technical modality (28.18%), the *telesecundaria*, also known as distance learning modality (20.80%) and the secondary for workers (0.70%).

The secondary schools in the general modality are placed in rural and urban areas and follow the traditional format where each subject is given by specialist teachers.

The curriculum of the technical modality is focused on the technical issues that are needed in each region and it could be focused on agricultural and livestock production, fishing production, forest production or services. One of the principal objectives of this modality is that at the end of their studies the students have the skills and knowledge needed to incorporate themselves within a productive activity.

The *telesecundaria* modality is designed to attend population from urban, suburban, rural and marginalized areas, in which it has not been possible to establish general or technical education modalities. One of the reasons of that is that in such areas there are a reduced number of people who has finished the primary education. In this education modality there is only one teacher per grade, who assists the students with their schoolwork, answers questions and facilitates the lectures that are given through satellite television.

Finally the secondary-for-workers mainly enrol people who are over 15 years old, whom were not able to take the secondary education in the relevant age.

Upper secondary education

Upper secondary education is for people between 16 and 18 years old and includes 3 grades. At present the total enrolment corresponds to 3.9 million students and the rate of coverage of this level is 57.30%.

Many of the upper secondary schools are part of the large public universities, like the National University (UNAM) or the National Polytechnic Institute (IPN). Upper seconday schools offer general and technical modalities. The people who study in these institutions obtain a high school diploma that allows them to study at the university.

There are other upper secondary schools in which the curriculum is more technical and are focused on students who do not necessarily want to study at the university. These Professional Technical Institutions provide their students with a technical preparation that allows them to start working immediately after finishing their studies.

A reform was implemented in recent years that, through taking additional lessons, allow students from these institutions to get a high school diploma also and to continue studying at the higher education level (Santibañez et al, 2005).

Higher education

There is not a specific age to study at the university, but most of the students who are at this level are between 18 and 25 years old. At present the higher education system enrols almost 2.6 million people and its rate of coverage is 23.80%.

Most of the students are enrolled in the large national universities, according to Santibañez et al. (ibid) almost 55%. In addition to these large national universities, each of the 32 Mexican states has a public university and a teachers' training college. The students who enrol in this modality obtain a university diploma.

For the people who can not or do not want to spend four to five years in higher education, there is another option called Technical University. This option lasts only two years and is intended to provide students with the skills and knowledge needed to incorporate themselves in to the labour market in a higher level than the ones who study the upper secondary technical modality. The people who study in these institutions obtain a Higher University Technician Diploma.

Finally, there is the possibility to continue studying at a postgraduate level. The options are: a Certificate degree, which lasts one year; a Masters degree, which

lasts two years; and a Doctorate degree, which lasts between three and seven years depending on the programme.

In all the levels and modalities there are two options: public, which is the one offered by Government; and private, which has to be affiliated to the SEP in the basic levels in order to be officially validated. . At present, private education represents only the 14.93% of the whole education system.

The next figures show, in a schematised way, the structure of the Mexico education system and some general figures about it.

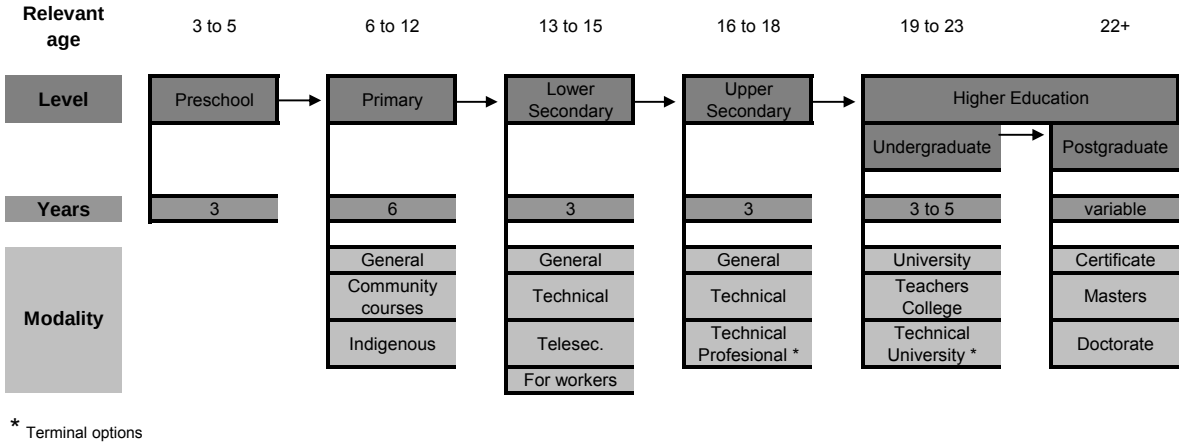


Figure 10. Structure of the Mexican Education System

Table 44. Mexico Education System Figures

Period 2005-2006[e]							
	Students	**%**	**Teachers**	**%**	**Schools**	**%**	**Rate of coverage**
By fund source							
Federal	3.388.70	10,87%	191.48	11,84%	38.10	16,29%	
State	23.318.30	74,78%	984.61	60,90%	164.51	70,33%	
Private	4.265.80	13,68%	341.21	21,10%	34.91	14,93%	
Autonomous	1.509.30	4,84%	136.16	8,42%	1.97	0,84%	
By education level							
Basic	**25.024.20**	**80,25%**	**1.100.367**	**68,06%**	**216.18**	**92,42%**	**87,77%**
Preschool	4.524.50	14,51%	197.07	12,19%	87.18	37,27%	73,87%
Primary	14.498.30	46,50%	557.00	34,45%	97.14	41,53%	92,45%
Lower secondary	6.001.40	19,25%	346.30	21,42%	31.86	13,62%	89,51%
Upper secondary	**3.711.20**	**11,90%**	**256.25**	**15,85%**	**12.85**	**5,49%**	**57,30%**
Higher education*	**2.445.60**	**7,84%**	**260.15**	**16,09%**	**4.88**	**2,08%**	**23,80%**
TOTAL	**31.181.00**	**1.00**	**1.616.771**	**1.00**	**233.90**	**1.00**	**63,41%**

Governance

Looking to improve educational administration, in 1992 Mexico decentralized the basic education system into its 32 states. The decentralization was supposed to give states more control over educational budgets and greater influence over educational policy. According to Santibañez et al (2005) the decentralization was mostly administrative, because in most cases Sates still receive the mayor part of their budgets from the SEP (Secretariat of Public Education) in Mexico City and because most of the administrative decisions are still made in the Federal instances.

In the primary education, state authorities cannot design their own curriculum, they must instead follow the national one, designed and approved by the SEP in Mexico City. All primary schools in the country must use the nationally-produced text books for primary education, which are provided for free.

For lower secondary schools, the SEP in Mexico City publishes a list of the approved text books for each subject. Principals and state authorities can choose their textbooks from this list (idem).

Decisions about hiring, firing, teachers' salaries, curriculum contents, etc. are taken in a centralized way, neither the parents nor principals are allowed to participate.

As mentioned, SEP in Mexico City set the majority of the lineaments for the basic education system. With regard to the school calendar, at present it consists in 200 days per year, beginning in August and ending in June. Primary education is offered in three shifts: morning, afternoon and evening, all the shifts last four hours and the main subjects given in this time are: Spanish, mathematics, natural sciences and social sciences. There are other subjects that are commonly given as sports or physical education, music or arts.

Lower secondary education involves a day of seven hours that is mainly offered in two shifts, morning and afternoon; although some lower education schools offer the night shift (idem).

Besides the SEP, the other main actor in Mexico education system is the SNTE (National Union of Teachers). The SNTE is the only union of teachers in the country and all the teachers and administrative personnel must belong to it. At present the SNTE has over 1 million members.

Even though the SNTE has factions in all states, its leadership is strongly centralized and central SNTE negotiates directly with SEP in Mexico City about teachers' salary and salary increments. Other issues like hiring, placements of teachers and decisions concerning Teacher's Colleges are often negotiated by the SNTE factions in the states and local authorities (idem).

Assessment

According to De la Garza (2004), educational assessments have been strengthened considerably in the last fifteen years in Mexico. In the 90s, the standardized tests applied to students and teachers in the basic level were enthusiastically promoted by the SEP. In 1994 the CENEVAL (National Centre for the Assessment of Higher Education) was created as an independent agency from the government.

The creation in 2002 of the INEE (National Institute for Assessment of Education), also as an independent agency[39], helped to improve the educational assessment at the basic level, as its main purpose is to offer educational authorities and private sector suitable tools for the assessment of educational system at the preschool, primary and lower secondary levels (SEP, 2004).

Besides the assessments developed by the INEE and the CENEVAL, Mexico has participated in international assessment projects, such as the Third Mathematics and Science Study (TIMSS); the test of Latin American Educational Quality Assessment Laboratory of OREALC (LLECE); and the Program for International Student Assessment (PISA) of the OECD (idem).

The Mexican students' performance in these examinations was below desirable levels. For example, the 1995 TIMSS test show that Mexican primary school students in third and fourth grade scored about 20 percentage points lower in mathematics and science than students in other countries, such as the United States, Singapore, South Korea, Colombia, South Africa, and Iran. In the PISA-2000 test, Mexican students rank 34 in reading competencies only above Chile, Brazil, Macedonia, Indonesia, Albania, and Peru. Results from the 1997 LLECE test showed Mexico below the regional mean on the average of all scores[40] (Santibañez et al, 2005).

[39] Although both organisms, INEE and CENEVAL, were created as independent agencies from the government, actually the INEE receives their budget from the Government.
[40] Because only 13 Mexican states participated in the LLECE testing, these results may not be representative of the country as a whole.